SCIENTIFIC AMERICAN

[Entered at the Post Office of New York. N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY AND MANUFACTURES.

Vol. XLVI.—No. 9. [NEW SERIES.] NEW YORK, MARCH 4, 1882. [$3.20 per Annum. [POSTAGE PREPAID.]

THE "NEW YORK WORLD" NEWSPAPER.—A REMARKABLE ESTABLISHMENT.

There is no better proof of business talent than liberal enterprise, and the judicious expenditures which our contemporary and former neighbor, the *World*, has been making upon the new building (into which it moved just in time to escape the Park Row fire) and upon new and extensive mechanical appliances, bear witness to the prosperity of that journal, and to the ability with which its interests are managed.

The *World*, for twenty years, has held a foremost place in American journalism as a scholarly, acute, and courageous newspaper; and since it passed, in 1876, under the control of its present editor, Mr. Hurlbert, it has added to its editorial brilliancy and shrewdness a notable development of its news features, and a steady improvement in its mechanical department, the full effects of which are only now beginning to be perceived by the public. Now that the work of reorganization has been completed, and the paper provided with offices and apparatus designed especially for its occupation and use, and in convenience and efficiency absolutely without parallel in America, the harvest time of the *World* has clearly begun.

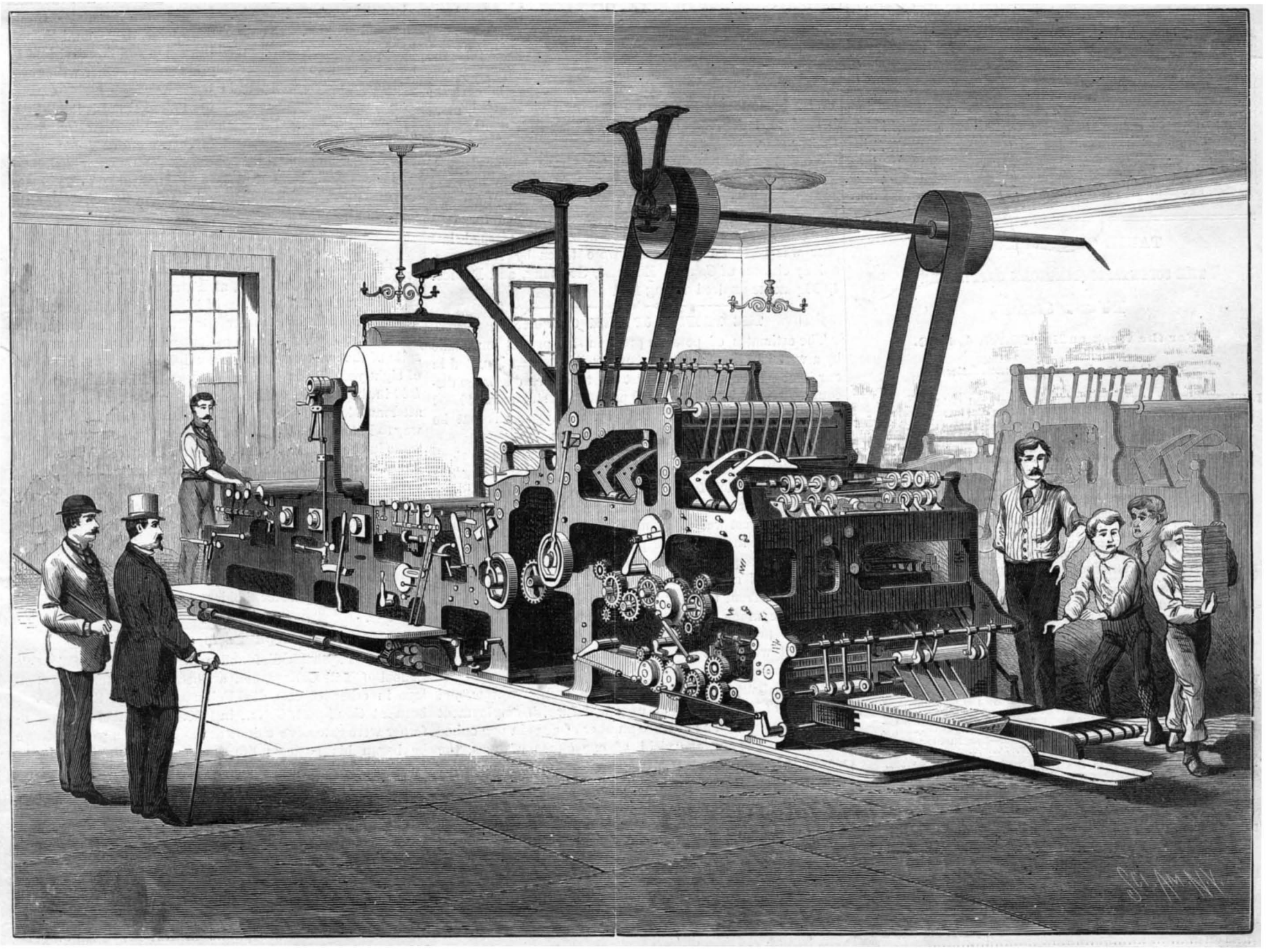
THE "NEW YORK WORLD" BUILDING, PARK ROW, N. Y.

The organization and administration of a great newspaper like the *World* demand the exercise of the most varied abilities. It is proverbially difficult to "run a hotel," but it is much more difficult to conduct a public journal, for while the latter enterprise involves as scrupulous an attention to a host of all-essential details, it is exposed to more unexpected and severer tests. The necessity for always working at the highest pressure, of always keeping a link of speed ready yet to put forth, and the closeness with which the product of this arduous labor is scrutinized in every respect, find no parallel in any other calling. Over and above all this, a great newspaper demands the combination of a rigid administration in details with a lavish gross expenditure. The secret of success lies in the saving of time at every possible step in the preparation of the newspaper, for nowhere else is the saying so true that "time is money," and this involves at least keeping abreast of all competitors in the matter of mechanical appliances, upon which the ingenuity of the whole civilized world is being exercised without intermission, and which represent sums of money that a generation ago would have been regarded as fabulous.

An inspection of The World Building, at 31 and 32 Park Row, and of the appliances there employed in the publication of the *World*, will convince any one that our contemporary has fully grasped the problem of successful newspapering, and has brought to its solution the highest skill and the wisest liberality.

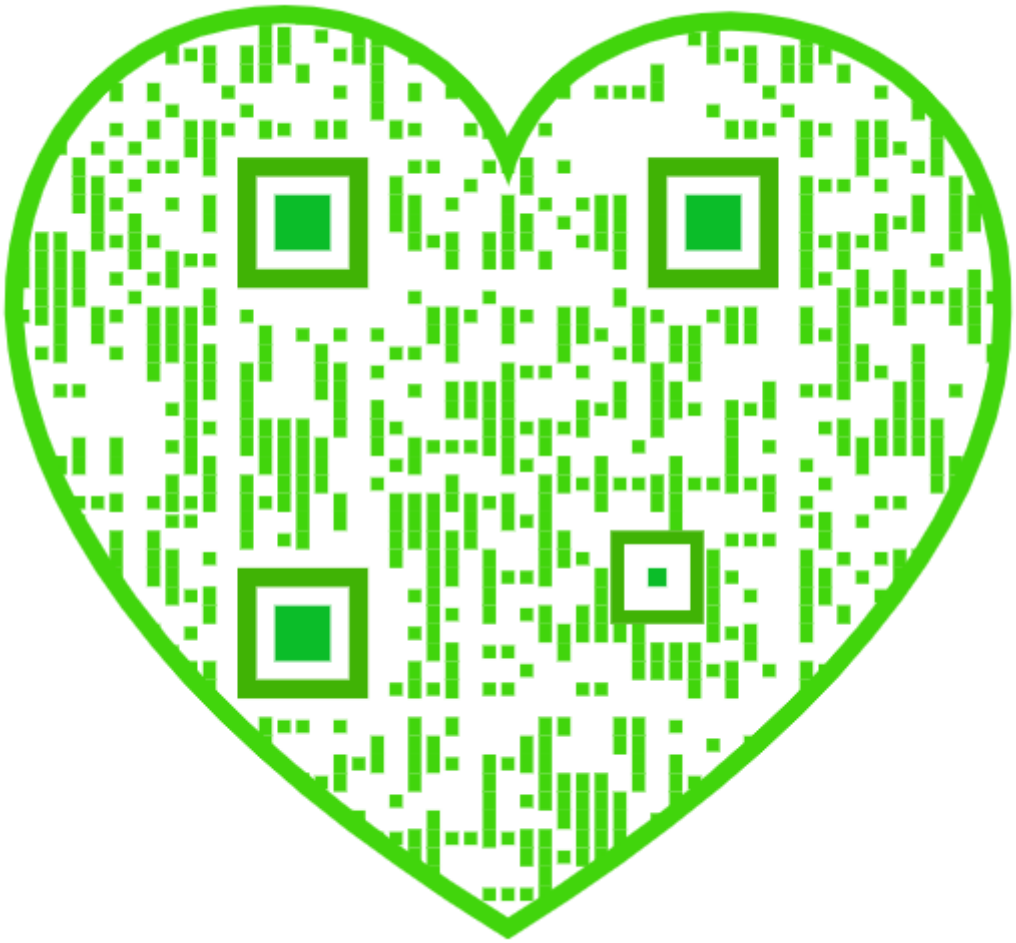
The building, erected especially for its occupation, is a handsome and massive five-story structure, with a frontage of fifty feet on Park Row

[*Continued on page* 130.]



PRINTING ROOM OF THE "NEW YORK WORLD" NEWSPAPER.—THE GREAT PERFECTING PRESS.

© 1882 SCIENTIFIC AMERICAN, INC



Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 261 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year postage included..... $3 20
One copy, six months, postage included 1 60

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.20 each: additional copies at same proportionate rate. Postage prepaid.

Remit by postal order. Address

MUNN & CO., 261 Broadway, corner of Warren street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, postage paid, to subscribers. Single copies, 10 cents. Sold by all news dealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year postage free, on receipt of *seven dollars*. Both papers to one address or different addresses as desired.

The safest way to remit is by draft, postal order, or registered letter.

Address MUNN & CO., 261 Broadway, corner of Warren street, New York.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, $5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. ☞ Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 261 Broadway, corner of Warren street, New York.

NEW YORK, SATURDAY, MARCH 4, 1882.

Contents.

(Illustrated articles are marked with an asterisk.)

Agate forest, an..... 138
Agricultural inventions..... 130
Ants, sound-producing..... 135
Beetle, Hercules, the*..... 135
Boiler notes, steam..... 137
Brake, electro-magnetic*..... 134
Cable work, an item in..... 137
Cat, fly-wheel, a..... 138
Chemical anomaly, a..... 136
Coal, cannel, in Iowa..... 134
Cooke, John..... 128
Electro-magnetic brake*..... 124
Engineering inventions..... 133
Establish't, newspaper, great* 127, 130
European governments, cost of.. 138
Explosion caused by lightning... 129
Explosion of oxygen, singular... 131
Explosive phenomena..... 136
Farmers' boys, prizes for..... 136
Fire escapes..... 133
Forty years in the Patent Office. 128
Gas engine patents in England.. 138
Gas holder, large, a, collapse of. 138
Glass, silvering..... 132
Hercules beetle, the*..... 135
Hydrophobia, its treatment..... 135
Invention mechanical, value of. 132
Inventions agricultural..... 136
Inventions, engineering..... 133
Inventions, mechanical..... 134
Inventions miscellaneous..... 133
Inventions, recent..... 131
Iron, preservation of..... 132
Ironwood tree..... 135
Lead..... 137
Life and death, com. view of..... 132
Life-saving service, the..... 129
Matches, Swedish..... 127
Mechanical invention, value of.. 132
Mechanical inventions..... 124
Melting points, app. for determ.. 132
Metals, Michigan..... 127
Metropolitan Museum, gains of. 129
Milk, novel reactions of..... 131
Moulds, infectious..... 132
Mount Etna Observatory..... 131
Muriate of pilocarpine..... 127
Naval defenses of England..... 128
Navy, proposed, the..... 134
Newspaper, *World*, N. Y., the* 127, 130
New York *World*, the*..... 127, 130
North Pole, new plan to attain.. 132
Optic nerve, mech. excitement of 136
Patent Office, forty years in the. 128
Patent Office, needs of the..... 128
Patents, gas engine, in England. 138
Phytocollite in New York State.. 132
Printing surfaces..... 136
Profits of silk culture..... 128
Public works in New York city. 137
Purchasers that need protecting. 129
Safety shield for circular saws*.. 134
Saws, circular, safety shield for* 134
Shale, combustible, in Iowa..... 132
Sheffield, Joseph Earle..... 128
Shrimp canning..... 131
Shutters, iron, condemned..... 133
Silk culture, profits of..... 128
Snow sheds..... 134
Steam boiler notes..... 139
Streams, mean velocity of..... 136
Swedish matches..... 127
Tortoises, water-carrying..... 135
Waters, underground, utiliz. of. 135
World, New York, the*..... 127, 130
Writing on glass..... 131

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT,

No. 322,

For the Week ending March 4, 1882.

Price 10 cents. For sale by all newsdealers.

PAGE

I. ENGINEERING AND MECHANICS.—Improved Gold Reducing Machinery. 8 figures.—A California reducing mill in section, with details..... 5127
Mining Flumes. 2 figures.—Bracket flume of Miocene Mining Company, Butte County, Cal.—Method of hanging flume to cliff by iron brackets..... 5128
Suggestions for Constructing Fireproof Buildings. By ISAAC P. NOYES..... 5129
Sir W. Armstrong on National Defense..... 5129
Foot Bridge over the River Welland, at Stamford, England.—Full page illustration, plans, sections, and details..... 5131
New Docks at Milford Haven..... 5132
Detailed Cost of a Locomotive.—Table of specifications.—Labor, material, etc..... 5132
Gas *vs.* Steam as a Motive Power..... 5132
A New Machine for Testing the Strength of Silk Fiber..... 5133
Artistic Rag Carpeting..... 5133

II. CHEMISTRY AND TECHNOLOGY.—The Dissociation of Chemical Compounds.—Address of Dr. WILLIAM WALLACE in Glasgow. 5134
Oleomargarine.—A favorable English view..... 5135

III. ARCHÆOLOGY, GEOLOGY, ETC.—The Antiquities of Yucatan. 4 figures.—Bust of Princess Nicte Canchi.—Hieroglyphic inscriptions.—The god Chaacmol.—The grand salon of the ancient government palace at Uxmal..... 5138
The Monuments and Inscriptions of American History..... 5139
The Desert of Sahara.—Observations by Dr. OSCAR LENZ..... 5139
The South Carolina Phosphate Mines..... 5142

IV. ASTRONOMY.—A Glimpse Through the Corridors of Time. Prof. R. S. Ball's Midland Institute lecture. The ebb and flow of the tides.—The geological work of the tides.—How the tides increase the length of the day.—Interaction of moon and earth.—The birth of the moon.—The tides of the earth primeval.—Earth changes.—Ancient and modern tides and their geographical influence.—How the earth's motion is retarded by the tides.—Lengthening day.—Ultimate destiny of earth and moon..... 5139

V. AGRICULTURE, ETC.—On the Harm Done by Earth Worms. Their numbers.—What they eat.—Their action on the soil.—Do they eat the roots of plants?—Their increase in New England..... 5135
On Manure Phosphates. By K. WALTER..... 5136
Cultivation of the Ramie Plant..... 5137
Hyacinth Bulbs. By GRANT ALLEN..... 5137

VI. HYGIENE, MEDICINE, ETC.—The Physiological Action of Coffee and Sugar. Dr. Leven's researches..... 5134
Sea Sickness. Views of a medical officer of a steamship line.—Causes and remedies.—Habit and will-power as preventives..... 5135

VII. ELECTRICITY, ETC.—Faure's Secondary Pile. 1 figure. Reynier's Modification of the Faure Pile..... 5133
A New Electrical Storage Battery. A very promising method of conserving energy..... 5133

VIII. NATURAL HISTORY.—A Sheep-eating Parrot. Curious change in the habits of a bird.—A fruit-eating parrot becomes a flesh eater..... 5137

FORTY YEARS IN THE PATENT OFFICE.

The last annual report of the Commissioner of Patents contains a comparative statement of the business of the office from 1837 to 1881 inclusive. Since 1840 the table shows the number of applications, the number of issues, the receipts, expenditures, and the surplus, where there has been any. Eight of these years (1837, '40, '41, '53, '54, '56, '57, '61) show a deficiency, the fees received being slightly less than the expenditures. Curiously the year 1855 shows a surplus of nearly $37,000, though the two preceding and the two succeeding years were years of deficiency. In 1859 the surplus had risen to over $35,000. It dropped to $3,500 the next year, and the next shows a deficiency of $16,000. In 1862 the surplus was $33,000. It fell to $6,000 the next year; and in 1865 it leaped from $11,000 to nearly $75,000. This was nearly doubled the next year, and the year after (1867) it dropped to less than $8,000. Between '67 and '71 the surplus aggregated nearly half a million dollars. The next four years were lean, the surplus falling as low as $12,000 in 1873. Since 1876 the surplus has ranged from $100,000 to about $250,000, aggregating in six years nearly a million dollars.

The fluctuations in the number of patents applied for and issued have been much less marked, though considerable variations are noticeable. The number issued in 1837 was 435. The number of applications reached a thousand in 1844, and five years later the issues for the first time reached and slightly exceeded 1,000. The year 1855 saw the number of issues raised to 2,000. During the next ten years the increase was tolerably steady, rising to 9,458 in 1866. The number stood at thirteen hundred and odd pretty uniformly from 1867 until 1875, the number of applications varying not far from 20,000 a year. After two years of gain the number dropped off once more, remaining not far from 1,300 until 1880. Last year it rose to 16,584, with 26,059 applications.

The ratio between the number of applications and the number of grants has shown considerable variations. During the earlier years the proportion of rejections was much greater than at present, amounting in 1847 to two-thirds of the total applications. This, in the opinion of the Commissioner, is largely attributable to the fact that the earlier inventors had fewer opportunities for discovering what had already been done in the same fields of invention, and, as a consequence, presented a larger proportion of crude devices and repetitions of each other. Possibly the spirit of the Commissioner had more to do with the numerous rejections, some of them acting as though this business of the office was to restrain rather than to encourage inventors. During the past fifteen years the ratio between the number of applications and the number of patents issued has been comparatively stable, and not far from three to two.

The total number of patents issued up to 1843 was less than three thousand. Ten years were required to raise the number to ten thousand. In the next ten years they rose to over forty thousand, and to a hundred thousand early in 1871. Since then the increase has been very rapid, more being issued between 1871 and 1880 than in the preceding thirty years.

To date about ten thousand patents have been reissued. The highest annual rate of reissue was reached in 1875 and 1876, when it exceeded six hundred. Since then there has been a marked decline, the number of reissues for 1881 being 471. The whole number of new patents issued last year was 16,113, of which 995 were taken by foreigners, chiefly citizens of Canada, England, Germany, and France. 4,638 patents expired during 1881.

THE PROFITS OF SILK CULTURE.

The estimates of possible profit in silk production, made by a writer in the Louisville *Courier Journal*, and quoted in our issue of February 11, must be taken with a large discount. His estimate of 1,000 pounds of silk from 40,000 eggs can be accounted for only on the hypothesis that he has somewhere misread pounds for ounces.

The figures given by Professor Riley, in his report as United States Entomologist for 1878, are more trustworthy; and his conclusion from them is that "silk culture never was and never will be an exceedingly profitable business; but it adds vast wealth to nations engaged in it, for the simple reason that it can be pursued by the humblest and poorest, and requires so little outlay."

The special advantages which silk raising offers to our people arise from the fact that our women folk in rural districts have much unoccupied time which might be pleasantly and profitably devoted to the care of a few worms, though it would not pay to hire the work done at current rates of wages.

It takes about six weeks to handle a crop of worms, and the yield of four ounces of eggs will furnish employment for two persons. The average number of eggs in one ounce is 40,000. The average yield of one ounce of eggs, the worms being well cared for, is 100 pounds of fresh cocoons, which will weigh 23 pounds when choked. Four ounces of eggs will yield about 400 pounds of fresh cocoons, which lose two thirds of their weight in the process of killing with heat, or "choking." As the fresh cocoons may be rated at 50 cents a pound, on an average, the yield of a crop of worms (handled by two persons) is about $200, instead of from $2,000 to $2,500, as estimated by the *Courier Journal* writer.

There are many thousand families in the country who have ground for growing a few mulberry bushes and spare time to devote to the care of a few thousand worms, to whom the addition of $200, or half or quarter of that sum, to the annual income, would be an item worth considering. As the Scotch proverb has it, "Many mickles make a muckle." With proper organization for marketing the cocoons, the aggregate efforts of many thousand women and children otherwise unemployed might make the country independent of the rest of the world in the matter of silk production. As skillful reeling doubles the value of the cocoons at the least estimate, the silk reel may possibly contribute still further to the profitable employment of time now wasted.

NEEDS OF THE PATENT OFFICE.

A considerable portion of the recent annual report of the Commissioner of Patents is properly devoted to a presentation of the urgent needs of the Patent Office for an increase in its working force and in the room provided for the transaction of its rapidly increasing business.

The receipts of the office during the past year were nearly $100,000 larger than in any previous year, and the excess of receipts over expenditures (nearly a quarter of a million dollars) was correspondingly greater than ever before. The Commissioner says frankly: "At the present rate of increase in the number of applications for patents either the work must accumulate upon the examiners' desks, or the quality of the work done must be such as to bring discredit upon the thoroughness of official examinations."

The annual increase alone represents a number two-thirds as great as the entire number of patents applied for in 1861, when Congress appropriated money enough for the support of sixteen principal examiners, each with two assistants.

Now the office has twenty-six principal examiners, twenty-four of whom have three assistants each. Thus in twenty years the examining force has been just about doubled, while the number of applications has increased from 4,643 in 1861, to 26,059 in 1881, or nearly sixfold. Twenty years ago the examiners had to be familiar with 31,000 American patents; now the number of existing patents exceeds 250,000, and the examiners are expected to search them all, besides the largely increased number of foreign patents and scientific periodicals. The printing of specifications and the reproduction of drawings in convenient form have done much to simplify and expedite the work of the examiners; but the gain has not been at all proportional to the increase in the work to be done.

As the office was never designed to be a source of revenue to the government, justice to inventors requires that the fees charged for service shall be materially reduced, or else the surplus should be expended in making the work of the office more thorough and speedy. Public interest dictates rather the latter course. In view of these facts, the Commissioner's recommendation, that four additional examining divisions be created, each to consist of a principal examiner with three assistants, seems well within bounds.

Seeing that any mistake in the Patent Office is liable to be followed by costly litigation or worse, neither individual inventors nor the public at large can afford to have such mistakes occur; certainly not the inventors, who, during the past six years, have paid into the treasury, through the Patent Office, a million dollars more than the service of the office has cost the government.

John Cooke.

John Cooke, President of the Danforth Locomotive and Machine Works Company, at Paterson, N. J., died in that city, February 20, at the age of 57. Mr. Cooke's successful business life affords another illustration of the truth that natural capacity, zeal, and patient work can win success in spite of the most unfavorable conditions. When but a child of eight years he worked in a cotton mill, frequently from 4:30 in the morning until 8 and 9 o'clock at night. He afterward learned the trade of a machinist, and, finding his way to Paterson about 40 years ago, was employed for some years in the Rogers Locomotive and Machine Works. In 1848 he became superintendent of the works, and four years later he joined the firm of Charles Danforth & Co., which had been engaged in the manufacture of cotton and cotton machinery. Locomotive building was now added to the business, Mr. Cooke taking charge of it. The firm has since turned out about 1,300 locomotives, the works having the capacity of 12 or 14 engines a month. Mr. Cooke was also one of the principal stockholders of the Passaic Rolling Mill Company.

Joseph Earle Sheffield.

Joseph E. Sheffield, founder of the Sheffield Scientific School of Yale College, and a liberal benefactor of the college in other respects, died February 17. Mr. Sheffield was born at Southport, Conn., in 1793. His father and grandfather were extensive shipowners. At fifteen years of age he began his business life as clerk in a shipping office in Newbern, N. C. Subsequently he removed to Mobile, where he became one of the largest shippers of cotton in the country. He returned to the North in 1835, and established himself in New Haven. He was one of the chief projectors of the New York and New Haven Railroad, and was the projector and for many years the president of the New Haven and North Hampton Railway Company. He was also engaged in the construction of the Chicago and Rock Island Railroad. He is chiefly known for his liberal donations to Yale College and other public institutions of learning in New England and in the West.

© 1882 SCIENTIFIC AMERICAN, INC

STEAM BOILER NOTES.

On the 6th of February a large rendering tank exploded at the works of the East St. Louis (Mo.) Rendering Company. The works are located northerly from the National Stock Yards. The building in which the tank was fixed was completely demolished by the explosion. John Casseca was killed and Jerome Tyler and John Meyerhoffer were seriously injured. The property loss is estimated at $15,000.

Rendering tanks are simply cylindrical vessels, usually upright, made of boiler iron plates riveted together as steam boilers are. Into these portions of the animal that are suitable for lard or tallow are introduced through man holes, which are then closed and steam is admitted at a temperature and pressure such as will most promptly and economically separate the grease from the animal tissue. The steam is conveyed to the tank from any suitable steam generator through pipes in the usual manner. The tanks should therefore be as strong as the steam boiler. Similar vessels called keirs are used in a form modified to suit the requirements for bleaching cloth and yarn.

Rags and other paper stock are usually bleached in large rotating iron cylinders mounted horizontally on gudgeon-bearings riveted to their end plates, through which steam is admitted while they slowly revolve upon their axes. Bleaching liquid is run in after the stock is put in through the manholes, which are then closed steam tight and the steam turned in. Radial pins are fixed to the interior of the cylinder for the purpose of lifting and turning over the stock as the cylinder revolves.

In some digesting processes acid liquids are used, in which case the vessels are made of either copper or some lead or tin lined metal plates. The various arts now require many modifications of this method of the employment of moist heat at higher degrees than can be obtained under atmospheric pressure in open vessels.

The extraction of coloring matter from dyewoods, and dyeing by some of the modern methods; the impregnating of woods and lumber with various preservative and fireproof compounds, by means of steam pressure and the accompanying heat, are, in addition to rendering, bleaching, boiling, dyeing, and extracting, familiar examples of the use of high saturated steam in detached vessels.

In vulcanizing hard rubber goods steam heat is used to heat the dies and formers in the process of pressing, because it can be perfectly distributed and controlled to the fraction of a thermal degree, which is not the case with direct furnace heat. It is obvious, therefore, that a proper study, in connection with boiler construction and explosions, is that of detached steam vessels which are now being used in such great variety in the industries of this steam age.

The records of boiler explosions, therefore, properly include explosions of detached or secondary steam vessels, and from such records it appears that bleaching, digesting, rendering tanks, and the like, which are too weak either constructively or on account of acquired defects to sustain the pressure at which they are attempted to be worked, burst or explode in a similar manner, and produce similar results to those that attend the explosion of steam generators that are exposed to the fire and to other causes of deterioration peculiar to their conditions of use. And, considering the many thousands of steam boilers now in use, the ratio being perhaps five hundred generators to one secondary steam vessel—it is astonishing that so many of this latter class distinguish themselves by exploding disastrously; more especially since none or almost none of the older explosion theories can by any stretch of imagination be made to apply to them. No fire is near these vessels; all their heat comes through pipes from a distant steam generator, and the burning of the plates of which they are made, or any other of the deteriorating effects of the fire, cannot furnish a foundation for low water, explosive ebullition, lifting of water or gas from decomposed water theories, that many people still hanker after and cull such facts as appear to support their favorite theories and offer only such in explanation, asserting that such and such are the most common, or, perhaps, the universal causes of destructive boiler explosions. Reverting to the East St. Louis tank explosion which has furnished the text for this note, it is possible that the nitro-glycerinists—a sect still extant—may gather imaginary support from the fact that the rendering tank contains all the elements of their favorite explosive, wanting perhaps only the sulphur, which may have been accidentally present from some carelessness on the part of a workman or otherwise. True such a thing as the assembling of all the elements of this most powerful explosive compound in a lard or tallow rendering tank is possible, yet the same may be said of the human stomach, with still greater appearance of probability, since a breakfast of ham and eggs contains the sulphur also which is generally absent in the rendering tank.

In the lard rendering process, there accumulates in the tank considerable water from the condensation of the steam exposed to the cooling effect of the iron of the tank and also from the animal tissue. While the water is kept in circulation by the action of the entering steam, the grease and water are intimately commingled though not chemically mixed, so to speak. This must continue till the grease is separated from the tissue; then the water may settle at the bottom, and, cooling to atmospheric pressure, the lard or grease is drawn off by siphon or a series of openings in the side of the tank.

During the rendering process the mingled grease and water have a temperature, due to the pressure of steam, which is often far above the atmospheric boiling temperature. Should a sudden rupture of the shell of the tank take place during the height of the process, especially a longitudinal rupture of considerable extent, the highly heated liquid gives out its extra heat, or that above 212° Fah., instantly on being relieved of pressure by the bursting of the shell. The water in the greasy liquid becomes largely steam, or rather it instantly expands and divides the whole liquid into a heavy spray with a suddenness that gives the character and almost the effect of a detonating compound, and the results are similar to those that obtain when a steam generator containing a like quantity of equally heated liquid breaks in a similar manner.

An experiment may be easily made by any person having the means at hand that will illustrate the fact that water practically explodes when relieved with sufficient suddenness of a high pressure, while at a temperature due to that pressure, as it is in a steam boiler. Place a piece of dry wood or other not very strong dry porous body inside of a short piece of iron pipe containing water. The pipe, say a short piece of steam pipe, having been fitted for this experiment by attaching to one end a gate valve with an open way as large, or nearly as large, as the opening in the pipe, and to the other end of the pipe attaching a steam pressure gauge and a safety valve, the whole will be a miniature steam boiler with water and a bit of wood in it. After fixing the small boiler firmly upon a suitably firm foundation, where steam can be raised, apply heat and raise steam to any desired safe pressure and maintain it till the porous body in the water becomes thoroughly saturated with the boiler water—a few minutes will suffice; then let the gate valve be opened with a jerk.

The instantaneous escape of the steam, followed so closely by the exploded water as to be sensibly simultaneous, may be expected, and the porous bit of wood (which should be of considerable size), if it can be found at all, will be reduced to fine splinters by the expansion, practical explosion, of the water with which its pores have been filled.

A practical application of this experiment is the reduction of wood and other suitable material to fibers preparatory to making paper pulp. This has been successfully done, but it was found too slow when conducted on a safe scale, and dangerous when done on a commercially economical scale.

N. Johnson was killed and four other injured by the explosion of a boiler in Tyler's sawmill at Bardstown, Ky., February 3. The mill was wrecked.

A dispatch from Doctor Town, Ga., says the boiler in the Kirkham Mill there exploded, February 19, killing David Mitchell and scalding six others.

The boiler in the Georgia Car Works at Cartersville, Ga., exploded just before seven o'clock, February 17, killing instantly five men and injuring a number of others, two of whom have since died. Superintendent Lucas, of the Lucas sleeping cars, and the engineer, named Wood, were injured, the latter, it is thought, fatally. The damage to the building is very great. The cause of the explosion has not yet been ascertained. The dead men are Leonard Choice, Matt Bomar, Hardy Hammond, David Richards, R. L. Patterson, and Sam Davis. E. L. Wood, the engineer, will probably die. Henry Hickson and Ellis Lowe are badly hurt. Mr. E. C. Lucas's injuries are not dangerous. The damage to the property is about $6,000. There is no theory as to the cause of the explosion.

A boiler in the Marion Distillery, at Portland, Ky., exploded, February 17. John Blake, the engineer, was seriously scalded. The roof was torn from the building in which the machinery was located. The loss will reach $2,000 or $3,600.

On the 23d of February one of a battery of three boilers in the rolling mill of A. M. Byers & Co., Pittsburg, Pa., on the south side, exploded, scattering its *débris* in all directions, injuring three men, and completely demolishing the boiler shed. F. Myers and John Lavelle, two of the men injured, escaped with slight wounds on the head. The other, name not ascertained, was seriously and, it is thought, fatally hurt. The explosion is ascribed to a broken flange connecting the boilers with the mud drum.

More "Innocent Purchasers" that Need Protecting

It is is reported that Missouri farmers are now buying experience in the guise of patent wagon-tongue rights.

Sharper No. 1 comes along, says he is doing a big business in wagon tongue patents, but is on his way home and will sell the right for that county for $250. The wary granger declines to be taken in, and the discomfited visitor says, "All right; but if you think better of it let me know;" and insists on leaving his address. A few days later No. 2 comes along. He has heard that granger has the county right for the patent, and will give $400 for it. The farmer sees an opportunity to make $150 in a quiet way, and sells the right. No. 2 pays $10 to bind the bargain, and goes his way. The farmer sends his note for $250 to No. 1—and the circuit is complete.

The Life Saving Service.

In a speech in favor of a bill to promote the efficiency of the Life Saving Service, Congressman S. S. Cox presented the following interesting statistics of the service since its establishment ten years ago:

Number of disasters reported, 1,347; value of vessels endangered, $16,083,320; value of cargoes, $8,429,167; value of property saved, $14,958,895; value of property lost, $9,853,592; number of lives imperiled, 12,259; number of lives saved, 11,864; number of persons succored, 2,610; number of day's succor afforded, 7,350.

Besides 11,864 lives saved from vessels in distress, the lives of sixteen persons were saved who were not on board vessels. Of 395 lives reported lost, 183 were on the Huron and the Metropolis, the loss of the former vessel happening when the stations were not open; while in the case of the latter the service was impeded by distance from the scene of the disaster. It is only in the last five years that the operations of the Life Saving Service have embraced the sea and gulf and part of the lake coasts of the United States. In 1871-72 its operations were confined to the coast of Long Island and New Jersey. Mr. Cox said that before the establishment of the Life Saving Service the loss of life on the coast of New Jersey alone amounted to hundreds annually. Since its establishment 315 disasters have occurred imperiling the lives of 2,754 persons, of whom 2,725 were saved.

The bill was passed February 20, providing for the establishment of 30 additional life saving stations and 6 houses of refuge.

An Explosion Caused by Lightning.

Lightning in winter is not common in this latitude; yet the accident which happened in the new tunnel of the New York, Ontario, and Western Railroad, above Hoboken, Feb. 21, showed that it is not always prudent to disregard the possibility of lightning in February. From the inquiries made by a *Times* reporter it appeared that the wires usually employed to supply the electric lamps in the excavation were used for the purpose of firing the charges, being disconnected from the electric light system for the moment and connected with the explosives. As a rule, six charges were fired together, those of the afternoon relay of men being exploded at very regular hours—the last six usually at 5:45 P.M. There were only 16 men in the shaft, and the work of connecting the wires had commenced, when the flash of lightning that occurred at 5:42 P.M. suddenly charged the conductors and produced the explosion. There were two flashes of lightning between the hours of 5 and 6 o'clock on Tuesday afternoon, the first taking place at 5:23 and the second 19 minutes later. The former simply caused a slight perturbation of the lights in the tunnel, but did not extinguish them. Five minutes later the work of disconnection and reconnection began, but only two of the six charges were ready for the pressure of the button when the last flash interrupted the proceedings. Fortunately the nature of the rock was such that none of the men employed in the shaft was fatally hurt by the untimely explosion. Miners employing electricity in firing charges will do well to suspend blasting during storms in winter as well as in summer.

Gains of the Metropolitan Museum.

The report of the trustees for the past year shows that the museum is now entirely free from debt. A number of very valuable additions have been made to the museum by gifts during the year. Among them are a very large and superb series of illustrations of ancient glass, of Phœnician, Greek, and Roman work; also a few specimens of Egyptian glass. Mr. Henry G. Marquand, one of the trustees, has enabled the museum to acquire, at a cost of $15,000, a collection of Greek, Roman, and mediæval glass, which admirably illustrates the historical sequence in the art (from the Roman period), and Mr. Jackson Jarves presented to the museum his own valuable collection, comprising a series of very beautiful illustrations of the revived art at Murano (Venice) and its achievements in Europe down to modern times.

By the gift of $6,000 from Mr. John Taylor Johnston the museum has been enabled to acquire the collection of engraved gems made by the Rev. C. W. King, of Trinity College, Cambridge, England. This collection includes 331 examples of Asiatic, Egyptian, Greek, Roman, and a few modern European gems. These have been catalogued and described by Mr. King himself, as have also a number of engraved stones and pottery seals, presented heretofore by Mr. Joseph W. Drexel, and a collection of Asiatic engraved cylinders purchased two years ago. The combined collection furnishes for the first time to American students an excellent series of examples of the glyptic art from its beginning through successive ages down to our own.

Mr. Joseph W. Drexel has presented a fine collection of gold, silver, and bronze coins from Egypt, and Mr. Alphonse Duprat a series of casts of ivory carvings, which next to the possession of the originals, now scattered in museums and private collections in Europe, are the best possible aids to students.

Among the most interesting works of historic character acquired during the past year are two bronze crabs, presented to the museum by Lieutenant-Commander Gorringe. These crabs formerly stood, with two others now lost, at the corners of the base of the Alexandria obelisk, which now occupies its place in Central Park, near the museum building.

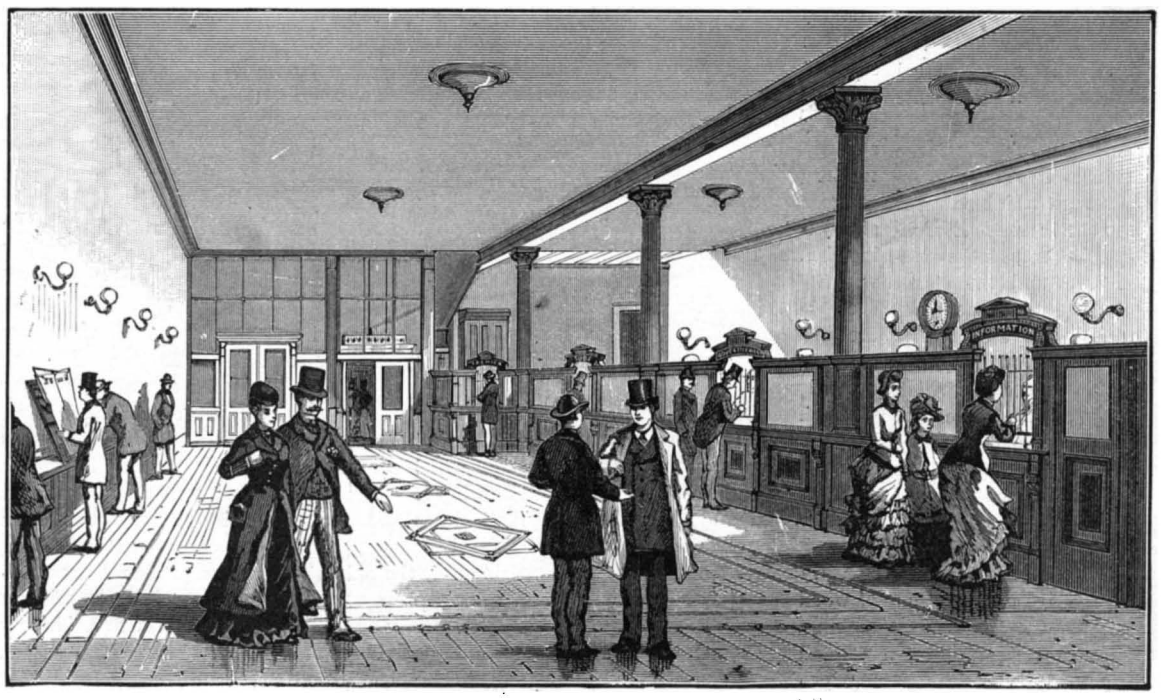
Another gift to the museum mentioned in the report is that of Mr. Paul Jean Clays, Mr. H. Le Roy, and several other gentlemen, who united in providing the means for purchasing an old painting by Mr. Clays, "The Celebration of the Fiftieth Anniversary of the Freedom of the Port of Antwerp," now in the gallery. The trustees also mention, with sincere sorrow, the death of their late associate, Mr. S. Whitney Phœnix, whose beautiful collection of ivories, silver, Oriental lacquers, embroideries, bronzes, paintings, estimated to be worth $50,000, was bequeathed to the museum.

© 1882 SCIENTIFIC AMERICAN, INC

THE "NEW YORK WORLD" NEWSPAPER ESTABLISHMENT.

[*Continued from first page.*]

and a depth of ninety feet to Theater Alley. It occupies perhaps the very best site available for the purpose, standing as it does within a stone's throw of Broadway and directly opposite the General Post Office. The greatest pains have been taken to meet all the desiderata of ample space, solidity, light, ventilation, and security against fire, and the handsome suites of offices into which the floors, not needed for its own use, have been converted, are not likely ever to lack tenants. The whole of the basement, from Park Row back to Theater Alley, is occupied by the *World's* newspaper and job presses, stereotyping, and other apparatus. The whole of the ground floor is given up to the counting room and mailing departments, while the whole of the topmost story, with part of the third floor, accommodates the editorial staff and the large force of compositors. The arrangements for communication between the various departments of the journal and for the handling of everything, from what may be called the raw material of the paper, "copy," and forms of type, up to the finished product of the daily and weekly *World*, leave nothing to be desired that ingenuity and experience could devise or money secure, while pneumatic tubes make the offices of the telegraph company and the Associated Press practically a part of the building, and a complete telephone system links The World Building not only with the general system of the metropolis and its suburbs, but with its editor's residence, with its up-town branches and employment bureaus, and with its special office at the Police Headquarters.



THE NEW BUSINESS OFFICE OF THE "NEW YORK WORLD."

The counting-room offers a novel and agreeable departure from the general rule which has heretofore governed the proprietors of newspaper buildings. They usually rent all the most eligible portions of their edifice, and coop themselves up in such scanty space as they cannot otherwise dispose of. The *World's* counting-room, covering the full width of the building and half of its depth, is unquestionably the most spacious, the best fitted, the most convenient, and the most attractive office of the sort, not in this country only but in the world.

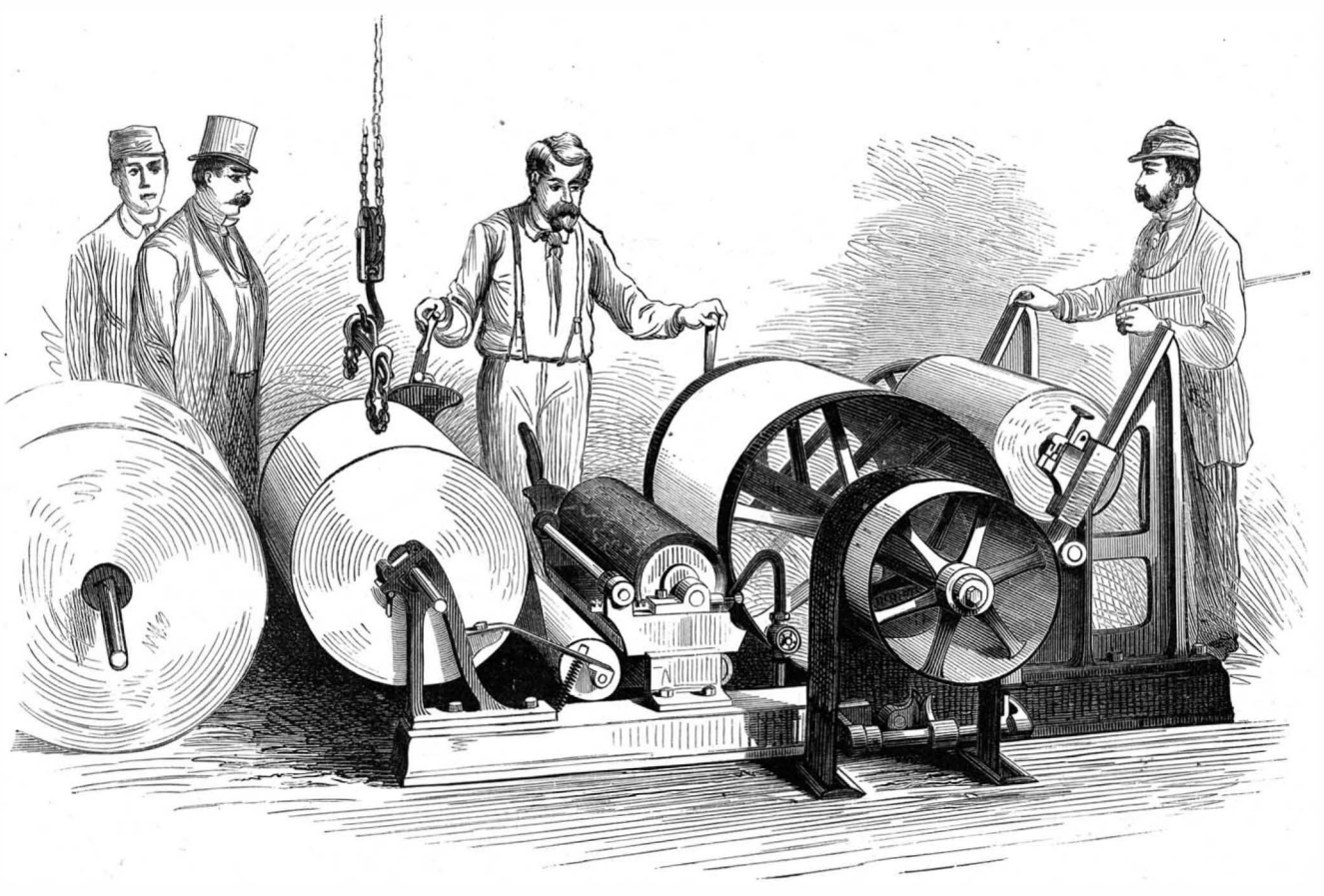
The business offices of nine American newspaper offices out of ten could be put into the lobby reserved by the *World* for the public, and there is room for two more such offices behind its counters. As the counting-room is lofty and glazed to the very ceiling, it is perfect in light and ventilation, while its cool tiled floors and polished counters, with their neat glass panels and shining brazen gratings, give it an agreeable and tasteful appearance without any sacrifice of its business character. Here, as elsewhere throughout the building, practicality and solidity, combined with simple good taste, have ruled all the arrangements and made them successful. Another admirable innovation in newspapering, following upon the *World's* employment bureau and system of summer resort registers and school registers, has been introduced in the form of an Information Bureau, where are kept on file circulars, catalogues, and plans supplying all the information concerning advertisements in the journal which the advertisers themselves could supply.

In the rear of the counting-room are the wrapping and mailing departments, where the papers thrown off from the new and magnificent Hoe presses beneath, at the rate of more than 30,000 copies an hour, are finally distributed to newsdealers and carriers, to the post office sorters, or to the *World's* own agents, whose neat light vans, drawn by strong express wagon horses, may be seen in the early morning bowling along the streets uptown or in the adjacent cities.

The editorial rooms on the topmost floor, eight in number, include the offices of the editor and his executive assistants, the editorial writers, the city department, and the staff charged with passing upon, digesting, condensing, and preparing for the printers the—literally—hundreds of columns of news which are brought nightly to the *World* from its correspondents in all parts of the earth, from its large and active corps of local reporters, from the agents of the Associated Press, and from all the other sources from which a great metropolitan journal collects the matter, only the cream of which, the public should remember, it can possibly present to its readers. The *World* has always devoted particular assiduity and intelligence to the work of editing the day's news and to furnishing appropriate comments thereon while the event is still fresh in the public mind. The advantages of this system, as compared with that of beating out cold iron a day later, are too obvious to need further comment from us. The process naturally requires keen intelligence, tireless labor, and elaborate organization; but the reward is proportionally great. True to the *World's* central principle of compactness and economy in all matters of time and space, the composing-room, a lofty and excellently equipped hall, where some fifty compositors are employed, is connected directly by an iron bridgeway with the department from which the matter to be set up is furnished. There is certainly no newspaper building in the world where there is less time wasted, or where less labor is required to accomplish a given task.

The forms, each on its table, are lowered from the composing room to the press room, which is of the full size of the building, and contains, besides the new perfecting presses which were built expressly for the *World* by Messrs. R. Hoe & Co., and which include several important improvements existing in no other machines, an equally perfect job press, and the requisite machinery for damping the paper, stereotyping the plates from which the paper is printed, and so on. All the apparatus employed is of the newest and most approved description, and any one who is really interested in the practical subject of newspaper printing will be amply rewarded by a visit of inspection to this office. The rolls of paper, a league and a half in length, are wetted by steam power, which unrolls and rerolls the material through a spray of water at the rate of some fifteen miles an hour, while cranes pick up the wetted rolls, weighing half a ton each, and swing them into their places over the presses. More quickly than we could describe the process in detail, each page as it comes down from the composing room is made to yield a matrix of hardened paper, the thick sheet being laid upon the type and beaten into all the depressions of the form. A process here, which is adopted in no other office in New York, saves from five to six minutes of time, a priceless commodity when newsdealers wait and mails do not. The matrix, after being dried under screw pressure on a steam table, is fastened into a mould, into which the stereotyping metal is poured, and the slab thus obtained—an exact reproduction of the original form—is planed and cut down so as to fit with mathematical accuracy the plate cylinders of the presses. When the sixteen plates have been adjusted, and the process is so rapid that the material can hardly be handled, the end of the five-mile ribbon of paper is drawn down into the press, and a single touch upon the lever wakens the machine to life. In something less than a quarter of a second—for each of these Hoe perfecting presses prints, cuts, pastes, and folds more than fifteen thousand copies of the *World* in an hour—the paper has been smoothed of all wrinkles by one roller, has received an impression of four pages from a second cylinder, and of the remaining four pages from a third, has been partly cut away from the web by a saw knife, has entered on a system of tapes more than a quarter of a mile in length, and been torn away and divided into two sections, one of which has hurried forward and upward at a greater pace, having a longer journey to pursue, and received a baptism of paste, being then overtaken by its slower follower and wedded to it, and, finally, passing under the folding knives, has been shot out on the right side folded to an eighth of its size for the mail, or flung down on the left in quarter size for the newsdealer. There is merely a long whirr, and with the speed of a railroad train the long web is swallowed, cut up, digested, and poured out in two long streams of printed *Worlds*.

The illustrations which we give of the more important machines will be found of interest even by the non-professional reader, while to the person specially interested in the subject they will be of value as representing the furtherest bound of progress yet attained by American ingenuity in this important field, and as indicating the thoroughness with which this great metropolitan newspaper has equipped itself for a career of increased prosperity and ever-widening usefulness.



THE "NEW YORK WORLD" PAPER WETTING MACHINE.

Women for the Australian Colonies.

The English Women's Emigration Society are making great efforts to relieve the surfeit of English women at home by the encouragement of emigration, especially to the colonies. Agencies have been established in Australia, in Canada, in South Africa, and in Iowa. The bachelors of Queensland have offered two hundred free passages a month for comely women under thirty, and the home government has graciously consented to pay the passages of a limited number, with no stipulations about age. But

© 1882 SCIENTIFIC AMERICAN, INC

THE "NEW YORK WORLD."—TRIMMING THE STEREOTYPES.

so diffident are English women that last year only fifty-nine accepted these offers, and now the society, through *Macmillan's Magazine*, calls for "respectable and capable" loverless but not unlovely women to go forth for love of God, love of man, or love of money, as missionaries, as philanthropists, as housekeepers, or as helps, to subdue the colonies and replenish them, lest England become a kingdom of calico. There is no chance for an immigration of men; Englishmen even go to America for wives. The good women of England, therefore, standing on the census and seeing 900,000 more petticoats than pantaloons on the island, already behold a greater catastrophe than Macaulay's New Zealander is to see—a land without husbands!

Novel Reactions of Milk.

If a little tincture of guaiacum is added to fresh milk a blue color is produced. Milk heated to 80° or upwards remains uncolored. Sour milk takes the same tint, but the reaction is prevented by the addition of mineral acids and alkalies. If a little starch paste mixed with potassium iodide is added to milk which has been mixed with old oil of turpentine, a fine blue band appears at the surface of contact and spreads rapidly. Milk freed from albuminous matter does not give this reaction. If to fresh milk there is added first acetic acid to precipitate the caseine, then some caustic potassa, and lastly a trace of a solution of copper sulphate, the violet reaction characteristic of peptone does not appear; but if the milk is allowed to stand fifteen to twenty hours before this treatment, the violet color is obtained. Mr. Arnold considers the blue color due to ozone.

The Mount Etna Observatory.

The Municipality of Catania, in Sicily, has just completed the erection upon Mount Etna of an observatory at the height of 9,671 feet above the sea level. It is believed that in the Etna observatory spectroscopic results will be attained which are impossible at all the previously existing astronomical stations throughout Europe. The site of the observatory has been so selected that, in case of an eruption from the crater, a stream of lava would be divided above the building, and would pass it without injuring it. The structure surrounds an enormous pillar, which supports the great refractor, and the telescope is covered by a movable iron dome. In addition to the telescope the building is furnished with a collection of meteorological and seismological instruments. From the summit a lovely view is to be had of the half of Sicily, Malta, the Lipari Islands, and part of Calabria.

WHITEFISH IN CALIFORNIA.—The California Fish Commissioners have been successful in propagating whitefish from Lake Michigan in Clear Lake. In 1873 about 25,000 young whitefish were placed in the lake. Fine specimens are now being taken.

Writing on Glass.

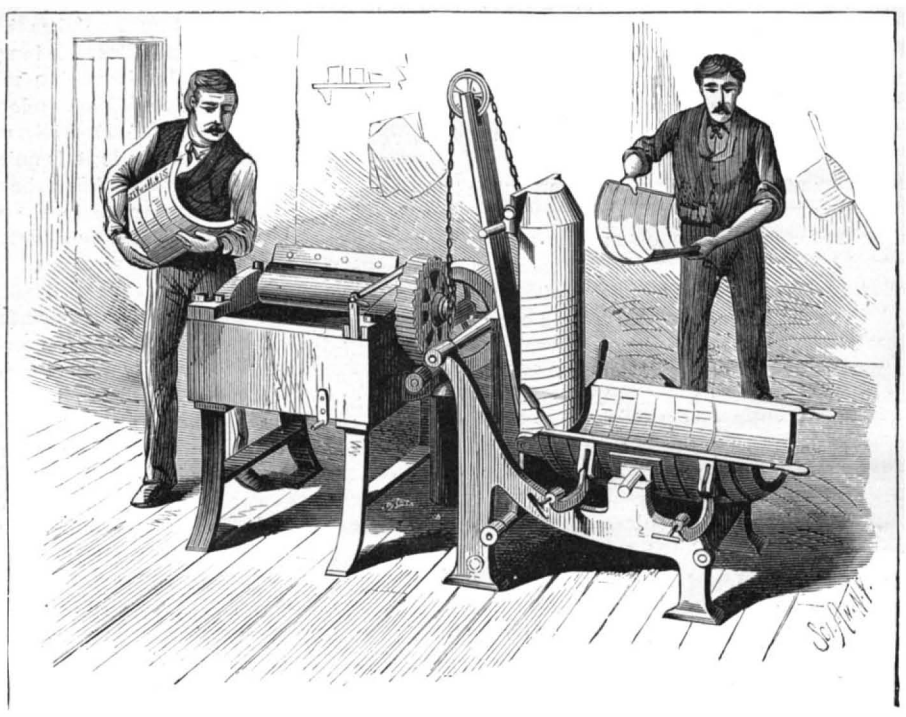
The following formula of a good varnish for writing on glass is given by M. Crova, in the *Journal de Physique:* Ether, 500 gr.; sandarac, 30 gr.; mastic, 30 gr. Dissolve, then add benzine in small quantities, till the varnish, spread on a piece of glass, gives it the aspect of roughened glass. The varnish is used cold. To have a homogeneous layer, pour over that already formed some oil of petroleum, let it evaporate a little, then rub in all directions with cambric cloth till all is quite dry. With ink or lead pencil, lines can be produced on this surface as fine as may be desired. Thus a drawing may be prepared in a few minutes and immediately projected.

Shrimp Canning.

Shrimp canning has recently been added to the industries of New Orleans. One new establishment employs 150 boys and girls and from 20 to 30 skilled workmen. Already the output is 10,000 cans a day, and it is expected that the product will soon be doubled. The shrimps are cooked and canned by a new process. It is intended to undertake also the canning of oysters, which are abundant along the Gulf coast, and, during the proper seasons, the figs and other fruits of the South.

Singular Explosion of Oxygen.

M. Sébère, of St Brienne, has been in the habit of storing his oxygen in a large gas holder of galvanized iron holding a hundred liters and sunk in water. After being about half full for several weeks he was about to make use of it by carrying a jet of the gas to a flame, with the result of the whole violently exploding. An investigation proved that no carelessness was at the bottom of the matter, the explanation being of a most simple nature, and one that theory would have predicted. A galvanic action had been set up between the iron and the zinc, and hydrogen had been liberated, an explosive mixture of the most powerful character being thus manufactured in the middle of the laboratory. M. Sebère's arm was broken, the place was deluged with water, and considerable further damage resulted. In order to prevent a similar accident, for the future M. Sebère will always keep the interior of his gas-holder well varnished.



THE "NEW YORK WORLD" STEREOTYPE PLANER.

RECENT INVENTIONS.

In the ordinary method of laying out ship timbers the hull is first outlined by strips of wood, named 'ribbands," and then moulds or patterns are made, which are strips of board made to conform in the curvature of their edges to the curvature of the sides of the hull, and which moulds are then laid upon the timber, and the ribs, knees, and frame pieces cut in accordance with such patterns. In this method of shaping the timbers errors in measurement are likely to be exaggerated, and a great amount of time, labor, and material is expended in the construction of the moulds. Mr. Charles E. Osenburg, of Baltimore, Md., has patented a device which he calls a "conformator," which permits the work to be accurately and quickly accomplished, and dispenses entirely with the use of moulds and their attendant expense. It consists in two bars held apart at their ends by filling blocks and tie-bolts, which main bars have two independent series of adjustable arms crossing the same, which arms may be adjusted so that their outer edges conform to any shape of a ship's side, and which shape, when fixed in the conformator by means of set screws, may, together with the bevels, be directly and exactly transferred to the timber to be cut.

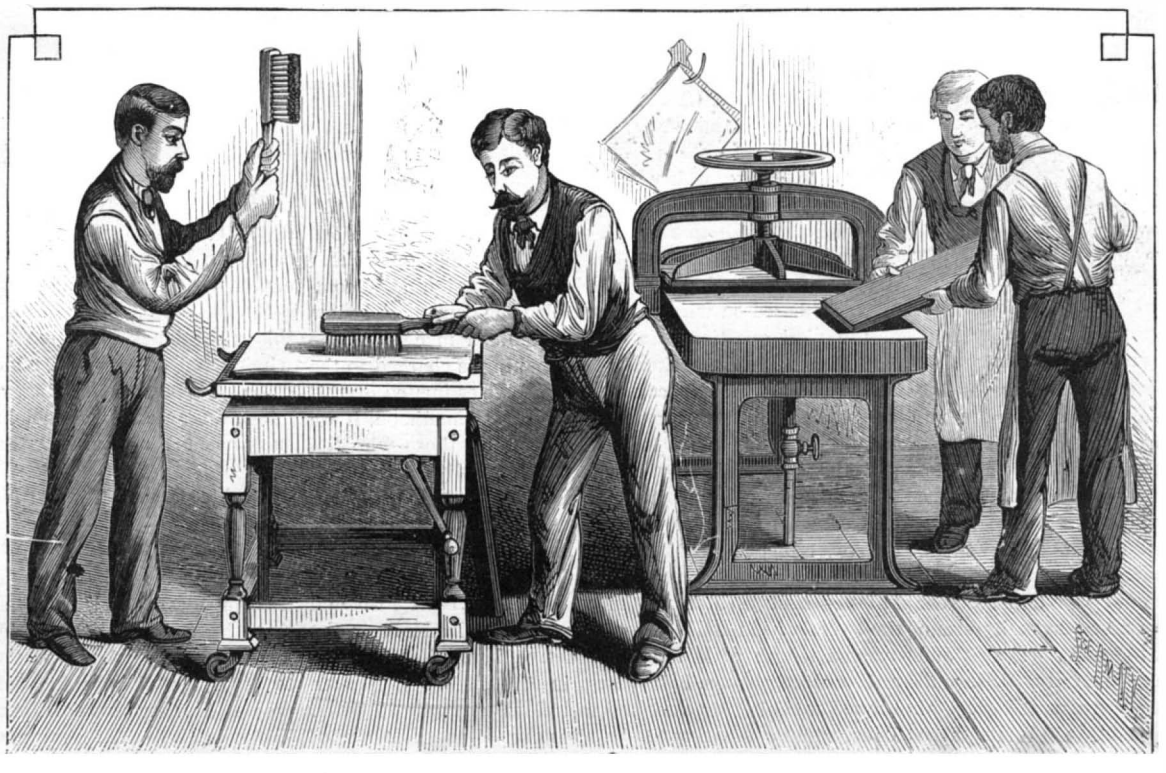
An improved machine for grounding wall paper has been patented by Messrs. Ira Robbins, of Camden, N. J., and David Heston, of Philadelphia, Pa. It relates to improvements in machines for grounding wall paper before printing.

An improvement in oil pumps has been patented by Mr. Alfred J. Lewis, of Barnhart's Mills, Pa. The object of this invention is to provide a vacuum pump for oil wells which shall be adapted for agitating the oil, to keep all passages feeding or supplying the pump free from the accumulation of sediment, paraffine, salt, or other obstructions, and to dispense with the ordinary inlet valves, which are liable to get out of order.

Mr. John B. Craig, of St. Louis, Mo., has patented an improvement in police nippers. This invention is an improvement in the class of nippers which are employed for seizing and holding the wrists or arms of prisoners, and curved jaws are so connected that the movement of one of them in opening or closing it will cause a like movement of the other. The jaws are S-shaped, or constructed with reversed curves; their upper ends are connected by means of toggle levers, which serve to open and close the jaw and to hold them closed when in a certain position.

Mr. Seth H. Fountam, of Amite City, La., has patented an improvement in mills such as are usually turned by hand for grinding coffee, spices, and similar things. It requires less power to operate it than those of ordinary construction, and there is no loss of the material passing through it.

Mr. Wm. E. Brown, of Irving, Kan., has patented an improvement in gutter hangers. It consists of a wire rod gutter hanger secured at one end to the roof of a build-



MAKING THE PAPER MATRICES.—"NEW YORK WORLD."

© 1882 SCIENTIFIC AMERICAN, INC

ing, and passing thence over and around and under a gutter, and having its opposite end secured to the roof, and a brace attached to the fasciæ at its inner end and secured to the opposite sides of the hanger above the gutter, so as to prevent lateral movement of the latter.

A New Plan to Attain the North Pole.

A Canadian engineer, Mr. Okill Stuart, has devised a plan of approach to the Pole by means of a chain of sled-huts from Chesterfield Inlet, which is 1,565 miles from the pole. He says:

Now, from Chesterfield Inlet to the north end of Lake Winnipeg, where supplies could be delivered by boat, is but 600 miles. This distance I would overcome permanently by building a system of relay stations twenty miles apart and connected by a through telegraph line to Winnipeg City at a cost of $120,000. This work would be carried out by government and would eventually pay, connecting, as it would, Churchill Harbor, mouth of Nelson River and west coast of Hudson Bay, where, in the future, will be the great emporium of the north, thus neutralizing this expenditure by the great advantage of a telegraph system for the purposes of emigration and trade. These relay stations of block huts would be stored with all necessary supplies for the undertaking, together with sleigh, dogs and men in charge, for purposes of transportation from Lake Winnipeg to Chesterfield Inlet, which latter place would be the headquarters of the expedition, in daily communication with the outer world. These sled-huts would be constructed of paper board, of the lightest design and frost proof; each sled would be about six feet wide and ten feet long, neatly rounded at the top and about five feet high, with a hole down through the center for a signal pole or anchor, to avoid drifting while resting in a gale. Each sled would be steel shod, shaped somewhat like a toboggan, rounded up at either end. Each sled would contain a kerosene stove, oil tanks and lamps, as well as a complete supply of preserved food, medicine, axes and ice shovels, sufficient for six men for six months, together with fur trappings and other clothing. When complete each sled-hut would weigh one thousand six hundred pounds, or a little more than two hundred and fifty pounds per man. Thus equipped we would commence the forward march by moving ten sleds at a time, manned in the following order: To each sled one practical engineer, one doctor, and four able bodied men, all thoroughbred Canadians; thus ten sleds would comprise sixty men. These would advance in order at intervals, all keeping the due north course, and any deviation would be reported by a halt from the advance sled. All the sleds would be advanced in this order until a complete chain of communication was established.

I would commence this movement about the 1st of December, or as soon as the ice formed on the more southern rivers. Our route would lie by the west coast of the Gulf of Boothia to Borrow Strait, thence to North Devon and North Lincoln by Jones' Sound, having land the whole distance, except Borrow Strait and Jones' Sound, which would be frozen. At North Lincoln we would be distant from Chesterfield Inlet 786 miles, and from the Pole 780 miles. To North Lincoln we would push all the sleds, except seventy-eight, which we would leave by relays of ten miles, all anchored with signals, so as to form a complete chain of refuge in our rear, and if found necessary, would establish a system of telephone from each sled by means of tripod poles. This would give us daily communication with Winnipeg, and govern our dog transportation trains, which would be in constant attendance throughout the whole line. When this was done we would commence our advance along the third or polar division in the same order as before, only by shorter relays, as we would have 122 sled-huts to station over 780 miles, or about six miles apart, so that each hut could be seen or reached with safety. It might be necessary to have some of these sleds constructed upon a boat principle, in case open water was reached, and could be used for towing others, as they would all be watertight and capable of being floated. But as I do not contemplate finding open water this latter point would not offer any serious difficulty. The only obstacles likely to be encountered are rough and irregular ice ledges, which might have to be leveled or tunneled in places. In this manner I would expect to overcome the whole distance from Chesterfield Inlet to the Pole by the 1st of July, 1884, that being the best season for observations at the Pole. The whole cost of the expedition in this way, not including the telegraph line to Winnipeg City, would be about $70,000.

Value of Mechanical Invention to Civilization.

Mr. Frederic Harrison lately delivered a lecture at the London Institution on "The Real Value of Mechanical Invention to Civilization." No century, he remarked, had ever been so praised as our own for its marvelous mechanical inventions. But after all, our century was undeniably the heir of great and worthy predecessors. For 4,000 years and more men could travel as fast as their legs could carry them, now they were carried by rail. In our days news was flashed in a minute which not so long ago would have taken a year to arrive. Ten thousand shirts were now woven by steam in as short a time as the fingers took to make one. Gas and electricity had superseded tallow and oil. But these and other like achievements of invention were merely signs of material, physical, visible, and external life. Were we so much the happier for these things? The answer must be no. The nineteenth century was not an age of complete achievement, but of expectation and hope. A detailed comparison was instituted between this and former centuries in science, philosophy, and the arts. In summing up the results, Mr. Harrison reminded the audience that we are apt to be bewildered by the vast multiplication of our materials and our books, and betake ourselves to specialization. This often ended in trivialities. Our millions of books and our billions of facts could not help us, and we were shamed by the noble life revealed in Plato's Dialogues and the Odyssey. The moral sores of our age were probed, and though it might be urged that there could be no casual connection between these and our mechanical progress, yet there was undeniably a historical connection. Mr. Harrison felt no sympathy with Carlyle and Ruskin in their indiscriminate depreciation of mechanical inventions, but the worth of such things must not be exaggerated.

Infectious Moulds.

A lively controversy has been carried on in Germany on the subject of the pathogenic properties of a common mould fungus, and to the discussion an addition has recently been made in France by Kaufmann, who has investigated the subject in Chauveau's laboratory, at Lyons. As long ago as 1869 Grohe and Block produced in rabbits a fatal disease by injecting into their veins the spores of two common moulds, *Penicillium glaucum* and *Aspergillus glaucus*. The spores became arrested in certain parenchymatous organs, as the kidneys, liver, and lungs, and grew there, giving rise thus to "foci of vegetation," which killed the animals in three or four days. Grawitz repeated the experiments, but neither he nor Cohnheim could obtain any positive results, and they doubted very much the correctness of the previous conclusions. In 1880, however, Grawitz experimented by successive cultivation of these spores, in the endeavor to acclimatize them to such a soil as the blood. He stated that the mould growing on bread is innocuous, but by cultivation in media gradually increasing in fluidity and lessening in acidity, he succeeded in developing considerable virulence. The initial form of *Penicillium* is unsuited to an alkaline liquid, and if sown in it, is quickly choked by an abundant growth of vibrios. After, however, the serial cultivation has adapted the spores to the alkalinity, either they or the spores of *Aspergillus glaucus* grow freely and hinder the development of the vibrios of putrefaction. By injecting small quantities of the acclimatized spores, or larger quantities of those which are imperfectly adapted to live in the blood, he alleges that he has produced a trifling malady and conferred immunity against the more active virus. Koch, however, has denied the innocuity of the original form of *Aspergillus glaucus*, and asserts that Grawitz really experimented not with *A. glaucus*, but with *A. niger*, the latter being always inoffensive, the former always virulent.

In a mixed growth the former gradually preponderates, and after a series of cultures may exist alone, and hence, it is suggested, the results obtained. Löffler was unable to corroborate the alleged immunity obtained by inoculation. He injected small quantities of the spores of *Aspergillus glaucus* into three rabbits, of which two survived, and three weeks afterward were quickly killed by a fresh injection. The assertions of Koch and Löffler have been indignantly denied by Grawitz, but they are confirmed by the results obtained by Kaufmann. He finds that the *Aspergillus glaucus* grown upon bread causes death when injected into a rabbit, even in so small a quantity as one-tenth of a milligramme, and that its previous adaptation to a liquid and alkaline medium, and to the temperature of the animal body, is quite unessential for its infective property. If such adaptation has any influence, it only very slightly increases its virulence. He also finds that spores exposed to the ordinary temperature of the air for six months do not, in any degree, lose their pathogenic power.—*Lancet.*

A Commercial View of Life and Death.

The London *Sanitary Record* quotes a recent writer on vital statistics who calculates that of ten children born in Norway a little over seven reach their twentieth year; that in England and the United States of America somewhat less than seven reach that stage; that in France only five reach it, and in Ireland less than five. He tells us that in Norway, out of 10,000 born, rather more than one out of three reaches the age of seventy; in England one out of four; in the United States, if both sexes be computed, less than one out of four; in France less than one out of eight, and in Ireland less than one out of eleven, and he adds this significant computation, based on what may be called the commercial view of the vital question. In producing dead machinery the cost of all that is broken in the making is charged to the cost of that which is completed. If we estimated by this same rule the cost of rearing children to manhood, if we calculate up the number of years lived by those who fell with the years of those who passed successfully to manhood, there would be found between the two extremes presented in Norway and Ireland—both, be it observed, unnatural—a loss of 120 per cent greater in the first year of life, 75 per cent greater in the first four years of life, and 120 per cent greater in the years between the fifth and the twentieth, in Ireland than in Norway. In Norway the average length of life of the effective population is 39 and rather more than a half years, in England 35½ years, in France not quite 33 years, and in Ireland not quite 29 years. Thus, again comparing the best with the worst of a scale of vitality, in which both are bad, in Norway the proportion of the population that reaches 20 survives nearly 40 years, or four-fifths of the effective period, to contribute to the wealth of the community; while in Ireland the same proportion survives less than 29, or considerably under three-fifths of the effective period.

New Apparatus for the Determination of Melting Points.

BY C. F. CROSS AND E. J. BEVAN.

The apparatus consists of a small platform of thin ferrotype iron or silver, having an opening for the reception of a thermometer bulb and a small indentation or depression about 1·5 mm. deep and 2 mm. in diameter. A very small quantity of the substance is melted in the little depression, and while still liquid a thin platinum wire, bent like an L and fused into a glass float, is immersed in the liquid and held there until the substance solidifies. A thermometer is then inserted in the opening, and the whole apparatus plunged under mercury. The mercury is gently heated, and the thermometer carefully watched. As soon as the substance melts the float rises instantly, and the temperature is noted. Stirring is unnecessary, the whole of the substance is surrounded with mercury, and the attention can be concentrated on the thermometer.

Preservation of Iron.

A novel way of preserving the surfaces of iron has just been discovered. The treatment is as follows: The iron is subjected to the action of diluted hydrochloric acid, which dissolves the iron, and leaves on the surface a pellicle of homogeneous graphite, which adheres well to the surface of the iron. The piece to be preserved is next treated, in a hydraulically closed receiver, by hot or cold water, or, better, by steam, in such a manner as to completely dissolve and remove the chloride of iron formed. Finally the piece of iron is left to dry in the receiver, from which all liquid has been removed. A solution of caoutchouc, gutta percha, or gum resin in essence of petroleum is then injected. On the essence being evaporated, there remains a solid enamel like coat on the surface of the iron. Instead of previously eliminating the iron salt, it may be utilized in forming a kind of vitreous enamel. For this purpose the iron is immersed, after treatment with the acid, in a bath of silicate and borate of soda. A very pure and brilliant silico-borate of iron is formed, which closes up the pores of the metal. As to the disengaged chlorine, it combines with the free soda, forming chloride of sodium, which remains dissolved in the liquid. Thus the important question of the preservation of iron appears to have been brought another step toward solution.

Silvering Glass.

BY A. A. COMMON, F.R.A.S.

Solution 1.—Nitrate of silver, 1 ounce; water, 10 ounces.
Solution 2.—Caustic potash, 1 ounce; water, 10 ounces.
Solution 3.—Glucose, one-half ounce; water, 10 ounces.

The above quantities are those estimated for 250 square inches of surface. Add ammonia to solution No. 1 till the turbidity first produced is just cleared. Now add No. 2 solution, and again ammonia to clear; then a little solution, drop by drop, till the appearance is decidedly turbid again. Then add No. 3 solution, and apply to the clean glass surface. A film was obtained in forty-three minutes at a temperature of 56° F.

Mr. Common's plate of glass was rather a large one. It was thirty-seven inches in diameter and four and a half inches thick, and weighed four hundredweight.

Phytocollite in New York State.

To the Editor of the Scientific American:

On reading the account of a new mineral from Scranton, Pa. (phytocollite), in SCIENTIFIC AMERICAN of February 11, it leads me to offer you a description of something likely very akin to it found in this locality probably in very large quantities. There being a large tract of bog meadows, the cultivators of which, having only water from the surface ditches for culinary and drinking purposes, or by draining it in cans from the high land a mile away, tried the experiment a few years ago of sinking a well with a well auger, such as is used in sandy localities. At a depth of twenty feet they entered and raised a jelly-like muck, which very closely resembles the description given of phytocollite. It seemed to be in layers of vegetable matter and clay for a depth of ten or twelve feet, then a tough blue clay was entered. I have small samples of the clay from a depth of eighty-six feet, when the undertaking was abandoned.

It was thought by those interested in the undertaking that this same black jelly-like substance was underlying the whole scope of meadows, which is miles in extent. Whether or no this is one of the stages from peat to coal we can only guess, but an excellent fuel has been made from drying the substance taken from near the surface in ditching.

SAML. GREEN.

Florida, Orange County, N. Y., February 11, 1882.

Combustible Shale in Iowa.

An extensive bed of combustible shale is attracting attention in Iowa. It is reported by the Sioux City *Journal* that the shale had been tried in coal stoves and that it worked well. It burns freely in the open air, and trial is to be made of it as a fuel for locomotives. It was discovered in a search for coal, near Fort Randall, at a depth of thirty-six feet. The stratum can be traced for miles along the river bluff. The shale contains petroleum, and has a greasy, gritless look, somewhat like cannel coal.

© 1882 SCIENTIFIC AMERICAN, INC

MISCELLANEOUS INVENTIONS.

Mr. John Owen Smith, of Savannah, Ga., has patented a means for protecting windows or doors against the efforts of burglars to break in. It consists in a strong protective frame of metal or wood, provided with lugs at the top, adapted to enter seats formed in plates in the sides of the window frame, and provided with tongues of metal at the bottom, projecting at right angles to the frame inwardly, and adapted to enter horizontal holes in the window-sill and be locked by set screws or pins inside.

A combined button-lap and stay for garments has been patented by Mr. David W. Thompson, of Englewood, Ill. This invention relates to an improved combined button-lap and stay for the openings in garments—such as the opening at the neck of a shirt, the opening in the front or sides of drawers, overalls, etc.; and it consists in the combination, with the garment or body piece having simply a straight slit cut in it where the opening is to be, of a single piece of material, which, when folded and stitched to the sides of the slit, constitutes both an upper and under button-lap or fly, a facing, and a stay for re-enforcing the bottom of the opening, making a finished piece of work without raw edges.

An improved neck-yoke attachment has been patented by Mr. Harrison Hough, of Darlington, Wis. This invention relates to improvements in devices for preventing a wagon tongue from accidentally becoming detached from the neck-yoke and dropping to the ground; and it consists in a spring safety hook, the inner end of which is secured to the under face of the tongue. The spring hook is provided with a slot through which the holdback passes, the tension of the spring hook causing its hook to bear against the tongue near its outer end. By this construction all liability of the neck-yoke becoming detached from the tongue is obviated, the ring of the neck-yoke being prevented from slipping off the outer end of the tongue by the hook, and prevented from slipping backward by the holdback, and the spring safety hook can readily be applied to a tongue with the ordinary holdback.

An improved cuff holder has been patented by Mr. Joseph F. Guignon, of St. Louis, Mo. This invention relates to women's cuff holders; and its object is to do away with pinning the cuff to the dress sleeve, which tends to break and otherwise injure the cuff. It consists in a band of elastic material, which is buttoned to the cuff and allowed to expand against the inside of the dress sleeve by releasing a catch.

An improved heater and cooler has been patented by Mr. Charles W. Payne, of Center, Ark. The object of this invention is to heat beer, milk, or other liquids in cold weather, or cool liquids in hot weather, by partly immersing in said liquids a vessel of peculiar construction, through which a current of hot water, or steam, or cold water is made to circulate and be discharged therefrom without coming in contact with the liquid to be heated or cooled.

An improved mechanical musical instrument has been patented by Mr. Henry Wegman, of Ithaca, N. Y. This invention relates to musical instruments in which strips of perforated material are used for governing the admission of air to the reeds and pipes; and it consists in the novel construction by means of which the reeds and pipes can be operated singly and in combination with the same perforated paper.

An improved mechanical musical instrument has been patented by Mr. Robert W. Pain, of New York city. This invention relates to organs and other wind musical instruments which are mechanically played or controlled by one or more strips or sheets of paper or other suitable material perforated to represent the different notes or sounds it is desired to produce, and caused to pass automatically over air ducts, which, accordingly as they are opened by the perforations in the paper that has a valvular action relatively to said ducts, causes the reeds or other sounding devices to be played as required. The invention applies to instruments of this description in which an air compression pump or bellows is used as distinguished from an exhaust bellows. The invention consists of a cap having secured along its opposite side edges strips of organ leather, rubber, or other suitable flexible material of sufficient width to extend inward from each side to the tubes of the action board, so that the compressed air within the box or reservoir pressing down on the flexible strips will hold them upon that part of the perforated music sheet that is passing beneath them in such a manner that no air can escape from the box, excepting through the tubes or passages of the action board.

An improvement in heating and ventilating buildings has been patented by Mr. Lyman A. Spaulding, of Port Huron, Mich. The object of this invention is to obtain thorough and uniform ventilation of large rooms—such as public halls, school rooms, churches, and railroad cars—and as a consequence a uniform distribution of the heated air from the registers or other source of supply. The inventor uses floor registers connecting by passages with a ventilating shaft, the passages being so arranged that they are of uniform length between the shaft and registers wherever the registers be placed, so that instead of the exit of air being entirely at the registers nearest to the shaft, there will be a uniform action at every register.

Mr. James R. Burville, of Bainbridge, Ohio, has patented an improvement in music leaf turners. This device is designed for turning the leaves of music without attention from the player, except to touch a key, which liberates one leaf after another.

A skirt adjuster, that can be readily attached to and detached from the skirts, has been patented by Nannie C. Green, of Brooklyn, N. Y. The invention consists of two pieces of webbing provided with spring clasps for securing the webbings detachably to the edges of the skirt seams, the webbings being provided with rings or eyelets to receive lacing strings, by means of which the skirt is adjusted.

An improved shuttle box for looms has been patented by Messrs. Levi L. Lukens, of Chester, and Henry Holcroft, of Media, Pa. By a peculiar construction the second spindle, as ordinarily used, is dispensed with, and by this means the inventors are enabled to increase the width of the picker-strap, as desired, which in itself is an important advantage. By dispensing with the ledges, as ordinarily employed, the inventors are enabled to dispense with cutting the recess in the picker, thereby leaving it stronger.

An improved faucet, which can be fastened in the barrel without striking or hammering, has been patented by Mr. Albert Ruehe, of New York city. The faucet is provided with an upright arm near its inner end, which is passed under a catch on the upper end of a plate fastened to the head of a barrel, and provided with a bushing fitting in the bung hole, upon which the outer end of the faucet is pressed, so that the inner end forces the cork into the barrel, when a handled ring mounted loosely on the faucet and provided with a beveled cam is turned, forcing the annular shoulder of the faucet against the plate on the barrel head.

An improved earth scraper has been patented by Mr. Jasper N. Nutt, of Sidney, Ohio. The scoop is of ordinary construction, and is provided with the usual wooden back, but for securing these parts securely together two curved angle plates are employed, which are riveted or bolted to the outer surface of the back and to the curved portions of the scoop. The scoop is further strengthened by cross braces at the back and a shoe on the bottom.

An improvement in coffee pots has been patented by Mr. Jesse L. Fusner, of Bellaire, Ohio. The improvement consists in the combination, with a coffee pot, of an inclined crescent shaped shelf, secured to the inside of the pot below its spout, and provided with perforations near its inner edge, to prevent the grounds from covering the strainer.

Mr. George B. Siegenthaler, of Wooster, Ohio, has patented an improvement in boot straps for leather boots which consists of a strip of leather having its central portion folded to form three thicknesses and its folds suitably secured in place, and provided with the end slits, forming two tongues at each end of the boot strap, the planes of which are at right angles to the flat middle portion of the strap.

Fire Escapes.

Since the burning of the old *World* building the fire escape men have been about in swarms, and the commissioners have been overwhelmed with requests to inspect models. They don't want to see models. If an inventor has not confidence enough in his apparatus to build a practical working machine, he need not expect the commissioners to do it for him. But that is just what they do expect. They come here with models of intricate and cumbersome appliances which they call fire escapes, which it would be impossible to work at a fire, ask the commissioners to build a machine on the principle of the model, and then pay them a royalty for the privilege. The commissioners are not making experiments for the benefit of individuals at the expense of the taxpayers. Besides, there is nothing in the law that authorizes them to spend one dollar for life-saving purposes, or that makes it the duty of firemen any more than policemen to make special efforts to save life. Yet the firemen have always assumed this to be pre-eminently their duty, and no grander record of heroism and martyrdom is recorded than that made by firemen in their efforts to save life. Their experience teaches that the best portable fire escape is found in the light ladders that constitute the equipment of a hook and ladder truck. These are not always long enough, but longer ones would be cumbersome, and if mounted on a special carriage would seldom reach the scene of a conflagration in time to be of service. When buildings are erected beyond the reach of the fire service sixty-five foot ladders, the owners should be compelled to affix permanent ladders or effective escapes to the building. This is a matter for legislation, and owners of buildings should be required by law to provide adequately for the safety of their tenants. The old *World* building was not so equipped, and we trust that those persons who lost relatives by that fire will recover heavy damages against the owner for neglecting to provide fire escapes. With the present tendency to erect nine and ten story buildings, it is utterly impossible to provide the fire department with adequate life-saving apparatus. The owners of the buildings are the responsible parties, and they must be made to pay roundly for their neglect to provide suitable protection for the lives of their tenants.

On the subject of fire escapes the humorous writer of the New York *Times* discourses as follows:

Whenever a fire attended with loss of life takes place in this city scores of people immediately sit down and write to the newspapers suggesting plans for fire escapes. The recent fire in the Potter Building has brought out a more than usually large quantity of these letters, and each writer is sure that if his plan were to be adopted no more people would be burned to death.

Now that the tendency is to put up buildings of six, eight, or ten stories, to fill the upper floors with girls, and to so arrange the elevator shaft as to create a magnificent draught for a fire, the question how to render the inmates of such a building safe in case of fire is manifestly a very important one. They cannot escape by the roof, for even were the flames to allow them to climb out of the scuttle, they could not safely drop a distance of forty or fifty feet to the roof of the adjoining building. The stairways, being so many chimneys for the fire, would be in nearly all cases useless, and the iron ladders, miscalled fire escapes, which are sometimes placed on the outside of buildings, nearly always prove to be in precisely the part of the building where they are useless As neither the stairs, the iron outside ladders, nor the roof can be depended upon to enable people to escape from a burning building, it is obvious that same other means of escape must be provided.

The fire department cannot be expected to have ladders long enough to reach to the upper stories of our modern high buildings. Of course, long enough could be built, but they could not be put in position, and the last time the fire department made a trial of a newly-invented ladder, with a view of adopting it in case it should prove to be a success, the machine fell down and killed so many firemen that the department was led to entertain doubts as to its usefulness. The letter-writers do not often suggest the use of any similar apparatus, although one man urges the adoption of his patent fire escape—a sort of telescopic staircase, which could perhaps be placed in a position to do service provided every fire would give a week's notice of its intention to break out. As fires rarely give such notice, this particular fire escape does not seem to be all that could be desired.

An ingenious letter-writer thinks that in the center of every building there should be a fireproof circular tower, in the center of which should be a spiral iron tube, large enough to contain a man in a sitting position. All that the inmates of the building thus furnished would have to do in case of fire would be to ascend to the upper story, seat themselves one by one in the spiral tube, and shoot to the ground floor. It is doubtful if nervous men or timid girls would have the courage to undertake so unusual a journey in the dark, and there are, moreover, serious objections to the proposed spiral tube. Unless the interior of it were to be made perfectly smooth and to be kept well greased, some unfortunate person would be sure to stick in it, and those who might follow him would gradually fill up the choked tube and perish from want of air either before or after undergoing the process of roasting. On the other hand, were the tube to be kept well lubricated the unfortunate users would shoot with such frightful rapidity to the base of the tower that they would reach the landing place insensible, and would perish long before the firemen could drag them out of the tube with large corkscrews and forceps.

Not much better is the plan of the man who thinks that every room above the ground floor should be furnished with a large number of pairs of India-rubber balloons, different only in size from the toy balloons sold in the streets. He proposes that when a fire breaks out every person shall seize a pair of these balloons, inflate them with the gas from the gas burners, and then, holding one in each hand, jump out of the window and float gracefully to the street. This may be practicable in the eyes of the letter-writer, but the public will not have much confidence in the plan until the inventor has personally demonstrated its practicability by jumping from the highest story of the Morse Building with his balloons in his hands. Equally plausible is the scheme of the letter-writer who would compel the fire department to send to every fire a tank twenty five feet high and twelve feet square, mounted on wheels. This tank is to be placed under the windows of the burning building and filled with water from the hydrant, and, when all is ready, people are to be requested to jump into it with confidence that they cannot hurt themselves by jumping from any height into water twenty-five feet deep, and that the firemen will fish them out of the tank before they drown. Beautiful as this plan is in theory, it does not command the approbation of experienced firemen, who think that the water necessary to fill the tank could be employed to better advantage in putting out the fire, and that a tank full of drowned people is as useless a collection of curiosities as can well be imagined.—*Fireman's Journal.*

Iron Shutters Condemned.

During the examination of Mr. Esterorook, Superintendent of Buildings, by the coroner's jury impaneled to fix the responsibility for the loss of life at the old *World* building fire, he said that there ought not to be an iron shutter permitted on any building in the city. He stated that the effect of iron shutters was to confine a fire within a building, preventing the firemen from gaining access thereto, until it became a raging furnace within, resulting in a fire that could not be controlled. This is also the experience of all veteran firemen, and they are unanimously of the opinion that iron shutters have caused greater losses than they ever prevented. We have, says the *Fireman's Journal,* frequently given expression to this opinion in these columns, and are glad to have the fact so emphatically repeated by so good an authority as Mr. Esterbrook. He suggests that they might be of service in narrow streets in protecting a building from a fire raging on the opposite side of the street, but when employed for this purpose they should be left open habitually and only closed when danger is imminent. A far better protection, however, is a solid shutter made of wood and lined on both sides with tin. It would resist fire longer than iron, and will not break or shrink away from its position and give access to the flames. The sooner iron shutters are abolished the better it will be for property owners, and the more effectively will the firemen be enabled to do their work.

© 1882 SCIENTIFIC AMERICAN, INC

SAFETY SHIELD FOR CIRCULAR SAWS.

In using circular saws as usually arranged the workman is in great and constant danger of maiming or destroying his hands or arms by bringing them into contact with the cutting edge of the saw. He is also in great danger of being struck by splinters, blocks, or boards which are liable to catch in back side of the saw and be hurled forward with sufficient force to injure or kill the workman.

The engraving shows a self-acting safety shield, by which the descending or front part of the saw is automatically protected, so as to prevent anything coming into contact with this part of the saw until the shield is temporarily removed, for the purpose of sawing, and the shield is extended so as to shield or cover the back or ascending part of the saw to prevent anything from coming into contact with it there.

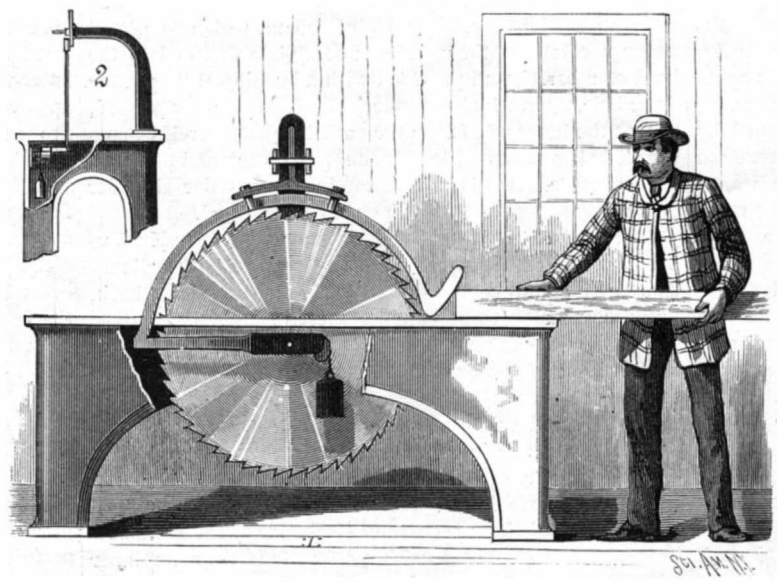
This self-acting safety shield is made of a plate of iron or steel, of about the thickness of the saw, the shield being curved to the radius of the saw, and is of sufficient breadth to give the proper rigidity. It is placed at a given distance from the teeth of the saw, and is provided with movable plates and adjustment slide and screw to suit the alterations in the diameter of the saw by wear, or the substitution of smaller for larger saws, or stuff deeper than the cutting part of the saw.

The shield is attached to an arm hung upon a stud concentric with the saw mandrel, and is balanced by a counterpoise under the table. The semicircular shield is about 1½ inches deep and the same thickness as the saw. The forward end is so formed that the piece of timber to be cut raises the shield, but the latter rests upon the timber and forms an effectual guard which prevents the workman from bringing his hands or arms into contact with the cutting edge of the saw.

As soon as the timber has passed from the saw the shield returns to its original position, entirely covering the saw, and so remains until raised by the next piece of timber.

This device received the highest award at the trial at the Royal Agricultural Society at Derby, in July, 1881, and it will commend itself to all mechanics.

Further information may be obtained by addressing Mr. R. W. Taylor, Patent Safety Shield Works, Bury St. Edmunds, Suffolk, England.



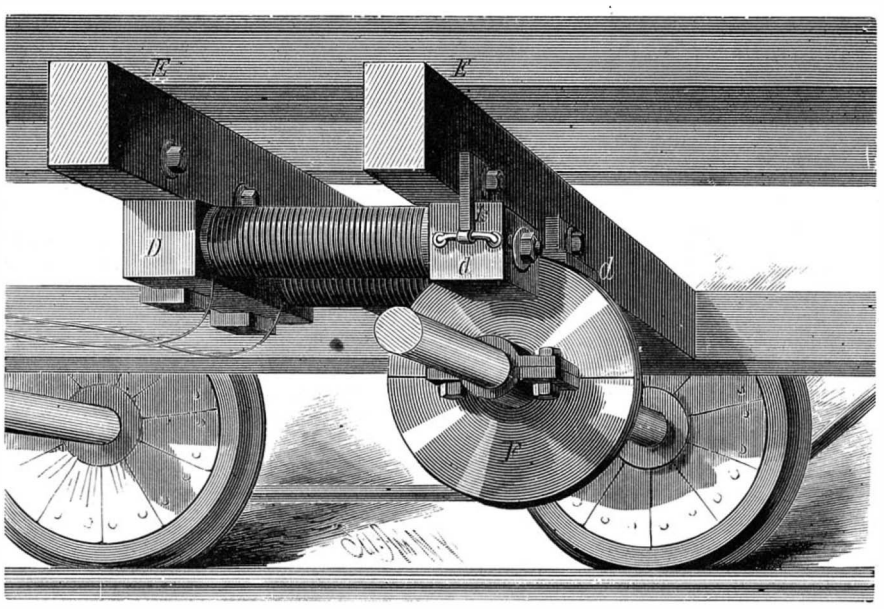
TAYLOR'S SAFETY SHIELD FOR CIRCULAR SAWS.

ELECTRO-MAGNETIC BRAKE.

We give an engraving of Mr. Edison's recently patented electro-magnetic brake. It is designed for use on any style of railroad vehicle, but is more especially intended for use in connection with a system of electro-magnet railways.

The invention consists in placing an electro-magnet in such relation to some rotating metallic portion of the running gear of the vehicle to be stopped that the magnetic circuit shall be through the rotating metallic portion, the electro-magnet being furnished with movable heads, which may move toward and clasp the rotating portion whenever the circuit of the magnet is closed. Upon the axle, and at or near its center, is rigidly fixed a disk of iron, which rotates with the axle and between the polar extremities of an electro-magnet supported from the bottom of the car. The cores of this electro-magnet are extended beyond the coils, forming a spindle, which is reduced in size when necessary, the ends being screw-threaded to receive nuts. Upon each spindle is placed a block of iron forming a polar extension, secured in place by the nut.

The orifices in the blocks, into which the spindles pass, are elongated, so that the blocks or polar extensions may have a movement to or from the fixed disk upon the axle rotating between them. The polar extensions are normally held away from the disk by suitable springs of low resilience. When it is desired to use the brake a circuit from any suitable source of electricity is closed through the coils of the electro-magnets, when the polar extensions mutually attract the disk, and the attractive force causes them to move to the disk and grasp it between them, causing a retardation or stoppage in its rotation, and so acting as an effective brake upon the wheels.



EDISON'S ELECTRO-MAGNETIC BRAKE.

Cannel Coal in Iowa.

A promising bed of cannel coal has lately been discovered about thirty miles from Des Moines, Iowa, down the river. It was found by parties prospecting for coal in the new line of the Wabash road to Des Moines. The coal occurs in a vein five feet thick, the lower two and a half feet of which is pure cannel coal, and the other half a coal much resembling Blossburg coal. The Des Moines Gas Company pronounce it fully equal to Virginia cannel coal. A six foot vein of common bituminous coal underlies the cannel, sixty feet below.

The Proposed Navy.

The House sub-committee on naval affairs have recommended the immediate construction of eleven vessels at an estimated cost of $9,000,000; this fleet to comprise one cruiser of the first class of 5,000 tons or over, and an armament of four eight-inch and twenty-one six-inch rifled guns; four cruisers of the second class of 3,000 tons or over, with an armament of four eight-inch and fifteen six-inch rifled guns; two rams; one armored torpedo boat; one cruising torpedo boat, capable of steaming twenty-one knots an hour; and two harbor torpedo boats to steam seventeen knots an hour. The cruising torpedo boat to be armed with one ten-inch rifled gun.

Snow Sheds.

The wonderful snow sheds—tunnels—on the Central Pacific Railroad are of two kinds, one with very steep roofs and the other with flat roofs. They cost per mile from $8,000 to $12,000, and in some places where heavy masonry was needed the cost reached $30,000 a mile. They are firmly constructed to support the great weight of snow and to resist the rush of avalanches. Fire precautions are very thorough. Corrugated plates of iron separate the buildings into sections, and in the great ten mile section there are automatic electric fire-alarms. At the summit is an engine and tank always ready to flood the ignited spot in a moment. These sheds shut in the view of the great Sierras, but without them travel would be impossible. Sometimes five feet of snow falls upon them in a day, and often thirty feet lies on the ground at one time, and in many places snow accumulates to the depth of fifty feet above these great wooden arches.—*Engineering News.*

MECHANICAL INVENTIONS.

An improved water meter with automatic governor has been patented by Mr. Julius Leede, of Washington, D. C. The operation of this meter depends upon the buoyancy of the water, which, acting upon floats, causes them to rise and fall and operate registering mechanism according to the quantity of water passed through and discharged from the meter No head or pressure of water being required, the meter is in practice located in the upper portion of the dwelling or other building to which water is supplied, and the pressure at the several discharge spigots is, therefore, such as is due to the height of the column, or, in other words, to the vertical distance between the meter and the spigots. The principal feature of the invention is the governor, which automatically regulates the action of the meter according to the quantity of water discharged. It is practically an automatic cut-off for controlling the induction and discharge according as more or less water is drawn off from one or more spigots in the building where the meter is located. The water flows through and actuates the governor by rise and fall within a suitable receptacle, thereby acting directly to open or close the valves that control the flow.

An improved gutter holder has been patented by Mr. William E. Brown, of Irving, Kan. This invention consists in the peculiar construction and arrangement of the parts, whereby the sections of a gutter are clamped together and held straight and even while being soldered. The holder is adapted to clamp gutter sections of different diameters.

A novel cotton-gin attachment has been patented by Mr Joseph Kopfler, of Amite City, La. This is an attachment to cotton gins to remove motes, sand, etc., from the cotton while being ginned; and it consists in the combination with the brush cylinder of the frames secured together and provided with a horizontal series of slats and an upwardly inclined series of slats.

Mr. Henry R. Robbins, of Baltimore, Md., has patented an improvement in passenger coaches for street travel, the object of which is to house or close in the pendent steps at the end of the coach, and provide also a door which, while it perfectly closes the body of the coach, will not be in the way of passengers in getting in and out of the coach.

Messrs. James Dempster and Henry Holcroft, of Media, Pa., has patented an improvement in carding engines which consists in combining with the carding cylinder a cylinder having a set of rings of card cloth and one or more strippers which have a longitudinally reciprocating movement between the carding cylinder and ringed eylinder, together with mechanism for actuating this stripper cylinder, whereby all of the fleece of the carding cylinder is transferred to a single cylinder having rings of card cloth, by the lateral distribution of the fleece as effected by the endwise movement of the stripper.

An improvement in steam boilers has been patented by Mr. George F. Major, of Brandy Station, Va. The invention relates to tubular boilers in which the tubes are arranged side by side; and it consists in the peculiar construction of a tube having a reduced end, and the alternately reversed arrangement of two or more series of such tubes, each series of which is connected with a drum at each end, with the drums so disposed as to form flues between the series of tubes.

An improved station indicator has been patented by Messrs. William H. Hackney, of Laramie County, Wyoming Territory, and Edward G. Hudson, of Lincoln, Ill. This improvement consists in the peculiar means for reversing the movement of the ribbon when wound up. An intermediate shaft is placed between the two shafts carrying the belt or ribbon, which intermediate shaft has a cog wheel adapted to engage with cog wheels on the ribbon shafts alternately by the lateral shifting of this intermediate wheel, the wheels on the ribbon shafts being set in different planes to permit this action, and the intermediate wheel being shifted by the longitudinal movement of the shaft, which is held by a latch entering one of two circumferential grooves in the shaft. The improvement also consists in providing the gear wheel which drives the ribbon shaft with a set of tappets to act on a spring-arm bearing a hammer which strikes a bell.

Mr. James E. Sarjent, of Brownville, Col., has patented a device for holding, upsetting, and welding tires for vehicle wheels, where they require to be shortened. It consists of two strong clamps having set screws, and adapted to be fastened to the tire on each side of the point where it is to be upset or "jumped" together. These clamps are provided with seats that receive the centers or bearings of a large yoke piece which extends from one of the clamps to the other. One of these centers is a screw provided with a handle, by turning which the one clamp is forced toward the other and the tire held by them is upset, so that it may be rapidly finished with a solid weld

An improved pneumatic lever for mechanical musical instruments has been patented by Mr. Alonzo Durkee, of New York city. The object of this invention is to provide an improved device for receiving air forced, under pressure, from the air reservoir or chest of a wind musical instrument which is mechanically played or controlled by means of one or more strips or sheets of paper or other suitable material perforated to represent the different notes or sounds it is desired to produce and caused to automatically pass over air ducts, which, accordingly as they are opened by the perforations in the paper that has a valvular action relatively to them, cause the reeds or pipes to be played as required, and to transmit the pressure to the corresponding pallet or valve, which is thereby opened to permit the escape of air from the pressure chamber to vibrate the reeds or tubes of the instrument.

Mr. George M. Rogers, of Wapakoneta, O., has patented a novel form of car coupling designed to couple with cars using the ordinary link without danger to the employes of the train.

Mr. Charles F. Jacobsen, of New York city, has patented an improved double cone reflecting chandelier, for use in

© 1882 SCIENTIFIC AMERICAN, INC

churches, theaters, parlors, and other public and private buildings, which is so constructed and arranged as to light the ceiling and walls as well as the floor and body of the room. It softens the light, destroying its glare, and diffuses it agreeably through the room, and at the same time is highly ornamental.

An improved bag holder has been patented by Mr. Thomas J. Bogue, of Riverton, Miss. This is a rectangular frame supported upon uprights and having its sides, which are loosely secured in the end pieces, provided with pegs or nails for holding the bag, and spring actuated levers for operating them.

THE HERCULES BEETLE.

The Hercules beetle (*Scarabeus hercules*) is one of the largest and best known of the beetle family. It is found in Guadeloupe, Colombia, Martinique, and occasionally in the neighborhood of Rio Janeiro, and varies slightly in size and color in these different places. In Guadeloupe are the largest specimens, possibly the best developed horns, and its curious habits have long attracted the attention of naturalists and travelers.

The male beetle is of a shiny black color, with long claw-like horns, covered on the under side with reddish-gray hairs arranged like a brush. The wing-cases are greenish-yellow, spotted with black, in the living insect; but occasionally, in preparing them for collections, the wings absorb a black substance from the abdomen and turn gray. This may be remedied by washing in benzine, which will restore the yellow color.

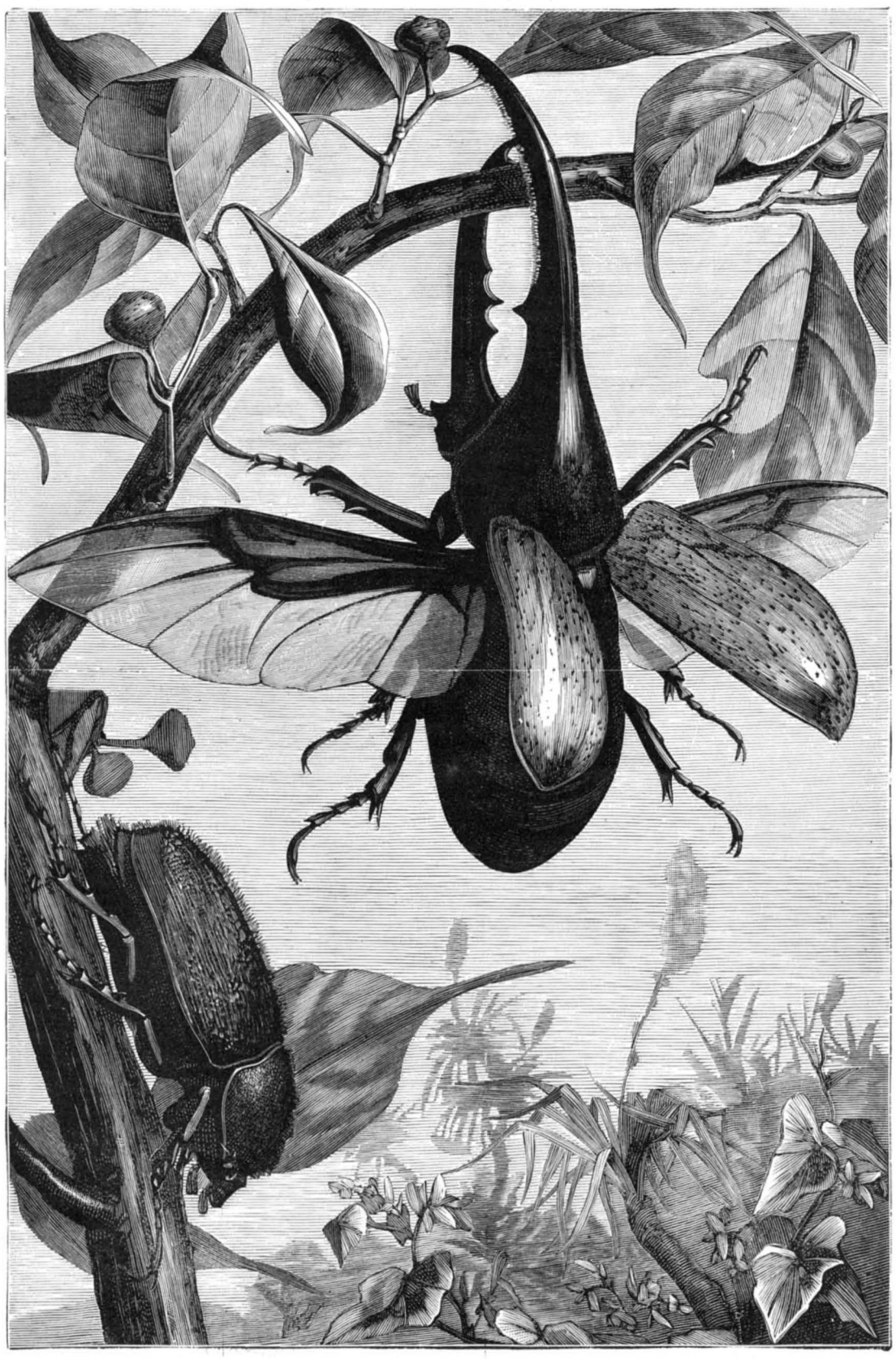
The male is over three inches long, including the horn, which, with the corselet, of which it is the elongation, measures nearly one-third of the whole length.

This insect may often be seen to seize the young shoots or branches of a tree between his strong horns (see illustration), and then turning rapidly around and around, by the aid of his wings, he cuts off the branch.

This revolution is so rapid that when the branch breaks off the beetle is often thrown to the ground with great force.

It has been supposed that he does this to obtain the sap of the tree, though his mouth would seem more suitable for devouring the green leaves.

The female has no horns, so it must be discovered by observation in what way she is able to obtain her food. She differs in other ways so much from the male that she might at first sight be supposed to belong to a different species. She is much smaller and has brown hairy wing cases, very rough and knobby on the shoulders. She deposits her larvæ in the trunks of decayed trees, where she forms a shell of woody *débris*, glued together for their protection.—*La Nature.*



THE HERCULES BEETLE—MALE AND FEMALE.

Ironwood Tree.

One of the hardest woods in existence is that of the desert ironwood tree, which grows in the dry wastes along the line of the Southern Pacific Railroad. Its specific gravity is nearly the same as that of lignum-vitæ, and it has a black heart so hard, when well seasoned, that it will turn the edge of an ax and can scarcely be cut by a well-tempered saw. In burning it gives out an intense heat.

Sound-Producing Ants.

D. M. Lewis, writing to *Nature*, says: "With reference to the question whether ants produce sounds which are of such a pitch as to be inaudible to the human ear, I should like to make a suggestion which occurs to me, but which I have no means of carrying out practically. It is a well-known acoustical fact that two notes of high pitch sounding together produce a third whose vibrational number is the difference of the vibrational numbers of the two primary notes. If now we suppose a vibration at the rate of, say, 60,000 per second, another at the rate of 38,000 per second would give a difference note of 22,000 per second, which would be well within the range of audibility. If then we send up a note beyond the extreme limit of audibility, we shall be able to detect the presence of vibrations which exceed that of the note sent up by the highest number of vibrations of audible sound. It would be interesting to know if this has been attempted, and if the microphone can be applied to assist in the investigations."

Water Carrying Tortoises.

At a recent meeting of the San Francisco Academy of Sciences a fine specimen of the desert land tortoise, captured at Cajon Pass, San Bernardino County, was shown, and Professor E. T. Cox related some curious circumstances in connection with it. This tortoise, which is as large as a good sized bucket, is a native of the arid regions of California and Arizona. On one being dissected it was found that it carried on each side a membrane, attached to the inner portion of the shell, in which was about a pint of clear water, the whole amount being about a quart. Professor Cox was of opinion that the water was derived from the secretions of the giant barrel cactus, on which the tortoise feeds. This cactus contains a great deal of water. The tortoise is found in sections of the country where there is no water, and where there is no vegetation but the cactus. A traveler suffering from thirst could, in an emergency, supply himself with water by killing a tortoise. They are highly prized by Mexicans, who make from them a delicate soup.

They are oftentimes attacked by foes, both for their water and also for their flesh. They are overcome by the foxes and killed by being dragged for miles over the country at a pretty rapid pace. Mr. Redding afterwards stated that he was on the Galapagos Islands in 1849, where he assisted in capturing 92 land tortoises, varying in weight from 450 lb. to 600 lb. each. These they brought to San Francisco, where they sold them for more money than the whole of the ship's cargo of lumber made. They were two months on board, yet they neither ate nor drank anything, though food and water were offered them. When killed, however, considerable quantities of water were found in each of them. They lived on the high lava rocks of the islands, where there are no springs or streams, and the only dependence of animal life for water is necessarily upon the irregular and uncertain rain showers. These were of a different species from the one shown. It was generally admitted that it would be useful if the habits and peculiarities of these animals could be noted and some trustworthy information as to how they collect and secrete their water obtained.

Hydrophobia—Its Successful Treatment.

Mr. Ruxton, a surgeon in the East Indies, reports a very remarkable case, which seems worthy of being classed with the small number of cures that are now on record.

A boy, between five and six years of age, was bitten in 1874, by a bull-bitch that was subsequently killed. The bites were deep and severe, but were freely cauterized with fuming nitric acid, causing considerable loss of tissue. Carbolized oil was subsequently employed as a dressing. A month later he became unconscious, refused to drink, and was exceedingly nervous. Mr. R., finding him with saliva issuing from the mouth, suspected the worst, but ordered, as a temporary measure, the tepid sheet, and a diaphoretic mixture. Tranquil sleep and diaphoresis followed, but about one in the morning the patient awoke screaming, had frequent convulsions, refused liquids, and foamed at the mouth. Thinking that as a palliative, cannabis indica might be usefully employed, five minims of the tincture were given, and a short sleep followed. This dose was repeated after an interval marked by screaming fits and saliva-spit from between the teeth. Deep sleep, lasting ten hours, now ensued. On awaking he recognized his mother—the first time for twenty-seven hours. His pupils were now intensely contracted. A third dose of five minims was given on the evening of the second day of medical attendance, and sleep ensued for eight een hours. Pulse and respiration remained good all the time. From this point the progress toward recovery was steady and continuous.

Dr. Ewart, formerly deputy surgeon-general in the Bengal army, in the same number of the *British Medical Journal* (November 19, 1881), states that little confidence can be placed in drugs after the symptoms have developed. He advocates cauterization as a prophylactic and as practiced successfully by Youatt in four hundred cases; and he quotes Sir William Guil, who states: "If I had to choose for myself, I would inhale ether and have the whole track of the wound destroyed by strong nitric acid or nitrate of silver." But Ewart places himself on the side of Sir Joseph Fahrer, who says: "If I were bitten by a dog or other animal, *even suspected* of rabies, I would suck the wound, put in a ligature, inhale ether . . . . and have the bitten part thoroughly cut out, and then cauterized with nitric acid or nitrate of silver, so as completely to disorganize any virus there might remain. Excision, he remarks, may be practiced successfully after the wounds are thoroughly cicatrized."

Utilization of Underground Waters.

Chief Engineer Robert Van Buren, of the Brooklyn Department of City Works recommends for the increase of the water supply the construction of another well similar to those built at the new stations on the water shed between Jamaica and East New York. From this well he proposes to run galleries east and west for a half mile or more, such galleries to take the place of an open canal. If the supply is found to warrant the extension of these galleries, he would urge their extension so as to intercept all of the water running from this watershed to the ocean. The work could be completed, he says, in a year, at a cost of about $200,000, and the increased supply would be from 3,000,000 to 5,000,000 gallons daily.

© 1882 SCIENTIFIC AMERICAN, INC

Process of Obtaining Printing Surfaces.

The following is a process by Mr. W. B. Woodbury, of London:

When it is desired to prepare a cast of ordinary type or engraved blocks a mould is taken in any of the usual materials—plaster of Paris or paper. Into this mould is pressed a thin sheet of tin foil, lead, or other sufficiently ductile metal, the back of which—that is, the depressed surface—is filled up with a solution of gelatinous material which will set sufficiently hard. The compound sheet of tin foil and gelatine thus formed is then removed from the monld, and its metallic face may be used as a surface to be printed from in the usual way, being either laid flat upon the bed of an ordinary printing press, or being bent or curved round the surface of the cylinder of a suitable printing machine. The method above described may be used to reproduce printing surfaces from blocks or plates of wood, metal, or other material having engraved or other designs upon them, as well as from ordinary type; and sometimes, where the subject of the design to be reproduced is of suitable character, and moisture is not present in the printing ink or during the operation of printing, gelatine or gelatinous material may be poured directly into the cast or mould, without the intervention of tin or other metal foil, and the gelatine surface so obtained may itself be used when dry as a printing surface without the intervention of the metallic face. The gelatine or gelatinous material may be hardened and rendered more impervious to water by the addition of a small quantity of chrome or other alum, or other substance capable of hardening gelatine and rendering it insoluble.

The surface of the tin foil which forms the printing surface, or of the gelatine, is preferably electroplated with a deposit of nickel, steel, or other hard metal for the purpose of rendering it more durable, and such deposit may be effected upon the surface of the sheet either before it is applied to and pressed into the cast or mould, as described, or after the compound printing surface has been completed. In cases where it is desired that the printing surface to be produced shall be more or less soft or flexible, so that it may be used as a hand or other printing stamp, gelatine or gelatinous material, to which has been added a sufficient quantity of glycerine or other substauce, such as sugar, capable of rendering the mixture sufficiently soft, flexible, and elastic when dry, is used as a back to the tin foil.

The process may be applied to the reproduction of designs or pictures obtained by means of photography in the following manner: Upon a plate of glass a gelatinous printing surface of any desired design or picture is prepared by means of light in the ordinary well known way. Upon the printing surface so prepared a sheet of tinfoil, preferably electroplated with a harder metal, is placed, and being covered with a number of thicknesses of blotting paper, is passed through an ordinary rolling press, until the metal foil is pressed into intimate contact with every part of the gelatine printing surface, every detail of the design upon which is thus reproduced upon the back of the metal. The surface so prepared and covered with the tin or other metal foil may be used for printing from in an ordinary printing press; or where the subject requires it, as, for instance, where half-tones are to be produced, pictures or impressions may be obtained by means of gelatinous ink, more or less transparent, applied to the printing surface, and thence transferred to paper placed upon it, either by means of a flat plate of glass or other material pressed down by any suitable press or by weights. When it is necessary that the design of the pictures produced should not be reversed Mr. Woodbury uses a white pigment, which he transfers to black or colored paper, or a positive instead of a negative photographic picture in order to obtain the gelatine printing surface. In the methods above described, in order to make the tin foil adhere to the gelatine when it is pressed against and into the design, the surface of the gelatine is covered with a thin solution of India-rubber in benzole. The tin or other foil pressed upon it adheres perfectly when dry.

A Chemical Anomaly.

M. Schützenberger has recently made a communication to the Chemical Society of Paris, which, if confirmed, will have an important bearing upon the fundamental principles of chemical science. While pursuing his researches on the petroleums of the Caucasus, the author has not been satisfied with the results of his analyses, which, though made with the greatest care, frequently showed more than 100 per cent of matter. It is known that the ultimate analysis of such bodies is effected by burning a weight, P, of the substance in pure dry oxygen, and by weighing the quantities of water and carbonic acid which alone are formed in the combustion. The weights p of hydrogen and p' of carbon are deduced from the quantities of water and carbonic acid found, and we ought to have $p+p'=P$.

For this calculation to be correct it is not necessary that the composition of water and of carbonic acid must be absolutely exact and constant; H_2O must contain precisely 16 parts of oxygen to 2 of hydrogen, and CO_2 must consist of 32 parts of oxygen to 12 of carbon. The best analysts of all countries have demonstrated that such is the fact. In the case of M. Schützenberger's analysis the weights p and p' of hydrogen and carbon, calculated for the formulæ H_2O and CO_2, are greater than P; and he finds $p+p'=P+m$, without being able to find any change in the nature and purity of the products weighed.

As the Caucasian petroleums have been but recently studied, M. Schützenberger considered it necessary to verify the facts with other products. Pure aniline and benzol showed the same anomalies, yet there can be no doubt as to the composition of bodies which have been for years so completely studied; 100 parts of benzol, C_6H_6, have given quantities of water and carbonic acid such that the sum of the weights of carbon and hydrogen present is = 101 to 101·5. All causes of error inherent in such analyses have been examined and discussed, and more than 150 experiments made.

The author has sought to prepare pure substances which should give 100 per cent, and others giving 101 per cent. In so doing he has made the curious observation that if Caucasian petroleum, aniline, and benzol are heated with sodium or copper, and distilled, they acquire the property of giving more than 100 per cent on analysis, and retain it for a long time if kept in the dark. An exposure of two hours to the light was sufficient to cause a sample which had previously given 100 to 101·5, in a series of determinations, to show no more than 100 per cent. Thus sodium and copper would have the curious property of modifying certain substances without changing their apparent properties. The fact of the possibility of causing compounds to yield more than 100 per cent by the action of sodium, and restoring them to the normal state by the action of light, eliminates all errors due to weighings and manipulations; such errors would appear promiscuously in bodies whether modified by sodium or not. M. Schützenberger, without proposing any formal theory, suggests that the composition of water and of carbonic acid is not always what is supposed. It may also be that the weight of atoms varies within certain narrow limits.

If what we call an atom is merely the result of a vibratory movement of matter according to a certain law, this vibratory movement of the hydrocarbons may possibly be modified by that of sodium or by the luminous vibration.—*Revue Scientifigues and Les Mondes.*

The Mean Velocity of Streams.

At a recent meeting of the American Society of Civil Engineers, a paper by Mr. R. E. McMath, of St. Louis, on the above subject, was read, and with it was presented a set of diagrams of curves, deduced from the experiments of J B. Francis, at Lowell, from the observations of Gen. Theo. G. Ellis, upon the flow of the Connecticut River, from the records of the flow of the Mississippi, made by Generals Humphreys and Abbot, and also from various other observations of the flow of the Mississippi, at Columbus, Ky., at Vicksburg, Miss., at Carrollton, La., and at the passes at the mouth of the Mississippi.

The author of the paper presents for consideration and discussion the suggestion that, to determine a reliable rule for the flow of streams in natural channels, the considerations affecting an artificial channel should be kept entirely distinct; that the definite law of discharge over a river is usefully applicable at any transverse section above and within the influence of a river, dam, or shoal; that the relation between mean and maximum velocity cannot be used in streams of irregular section; that head is pressure, but not in all cases full of surface; that in natural streams the bars or shoals are substituted for the weir or dam; that the level of no discharge is determined by the horizontal plane through the crest of a weir, dam, or natural bar; that two new hydraulic terms may be used, namely: permanent area, or that part of transverse section below the plane of no discharge; and ruling depth, or the depth of the plane below the surface. Formulæ are then suggested in application of these considerations.

Velocity of Propagation of Explosive Phenomena.

The question as to how quickly explosive phenomena in gases travel has now been fully studied by MM. Berthelot and Vieille, and the results are of a somewhat unexpected nature. The authors operated chiefly with an explosive mixture of hydrogen and oxygen at atmospheric pressure. A straight horizontal lead tube, about 133 feet long and one-fifth inch interior diameter, was filled with the mixture, and the explosion started by means of an electric spark at one end. The flame, as it went along, ruptured two electric circuits, by acting each time on a grain of fulminate of mercury applied to a thin strip of tin. Thus a delicate chronograph was affected (the Le Boulenge, having a precision equal to one twenty-thousandth of a second). When the tube, instead of being placed straight, was arranged in several parallel pieces with bent joints, the velocity seemed to be the same. The general average for both cases was 2,841 meters, or about 9,470 feet, per second. A doubt, on getting this high figure, whether it was really the rate of propagation of the detonation that was being measured, or whether a vibratory motion of the metal might not have been the cause of rupture of the circuits (though this seemed unlikely), was set at rest when the similar strong caoutchouc tube was found to give like figures. With a capillary glass tube the velocity was somewhat less, viz, 2,341 meters. Next, it was found that the velocity was much the same, whether one or other of the ends was open alone, or both were open, or neither. The velocity appeared to be uniform throughout the tube, and with pressure varied between one and three, the velocity seemed independent of pressure. Once more the velocity is different in different gases; thus, in a mixture of carbonic oxide and oxygen, it was found to be 1,089 meters, and dilution of the other explosive mixture, of hydrogen and oxygen, with air, reduced the velocity. For instance, in a mixture containing 45 per cent of the explosive gas the velocity was 1,439 meters.

AGRICULTURAL INVENTIONS.

Mr. Asa Chandler Hinson, of Pidcock Ranch, Texas, has patented an improved stock and suitable devices for connecting a plow to any pair of wheels and axle forming a part of a wagon. By these simple additional connections a farmer may construct a sulky plow in a cheaper and simpler manner.

Mr. Jacob S. Baker, of New Freedom, Pa., has patented an improvement in fertilizer attachments for grain drills, which consists in certain means for operating the valve that controls the discharge from the hopper.

An improved coupling for sulky plows has been patented by Mr. Michael Kite, of Prairie Township, Jackson County, Mo. The object of this invention is to allow a sulky plow to be turned at the corner of a "land" without raising the plow from the ground, and also to prevent side draught upon the sulky tongue. The invention consists in a double hinge coupling for sulky plows, constructed with a U-shaped bar and a bolt for clamping the plow beam, and the three bent bars hinged to the clamp bolt and to the draw bail of the sulky, whereby the plow beam will have a free lateral and vertical play.

Mechanical Excitation of the Optic Nerve.

It is commonly believed that, like most other nerves, the optic is sensitive to mechanical stimulation, that thus sensations of light may be excited, just as they are by a similar stimulation of the retinal elements. The question has been recently re-examined by Schmidt-Rimpler, who comes to the conclusion that the current opinion is true, although the grounds on which it is based are not altogether correct. It is usually asserted that division of the nerve in enucleation of the eyeball causes a sensation of light. The fact is, however, doubtful. Rothmund, of Munich, has several times extirpated an eyeball without anæsthetics, and has never known the division of the nerve to cause a sensation of light. It is probable, however, that in many such cases the fibers of the nerve are totally degenerated. A more conclusive instance has been met with by Schmidt-Rimpler. A large part of the contents of one orbit had to be removed on account of epithelioma. The eyeball was healthy, and vision with it considerable, but it could not be saved. The patient was perfectly conscious when the nerve was divided, and was asked if he experienced any sensation of light, but replied in the negative. It is suggested that the supposed stimulation of the nerve on division was really a stimulation of the retina in consequence of the tension of the globe by its necessary fixation at the moment of division of the nerve. Another fact which has been advanced as proof that the optic nerve is sensitive to mechanical stimulation, is the sensation of light which may be produced by extreme lateral movements of the eyeball. It has been referred to the stretching of some of the fibers of the optic nerve. But Schmidt-Rimpler points out that the sensation thus produced is that of a circle of light with a dark center, and that its apparent position corresponds nearly to the point of entrance of the optic nerve. It is difficult to conceive that the fibers which end near the disk have a course so separate from others that they are only stimulated when the nerve is stretched. It is more probable that the phenomenon is due to extension of the sheath of the optic nerve, which pulls upon the sclerotic around the entrance of the optic nerve, and so stimulates the retinal elements. The absence of reaction on division of the nerve does not, however, exclude altogether its mechanical sensibility, since other nerves, motor and sensory, which certainly possess this sensibility, may not react if quickly divided. That sensations of light may be produced by mechanical irritation of the nerve is shown by some observations made by Schmidt-Rimpler on persons from whom an eye had been removed not long before. A blunt instrument was pressed against that part of the orbit in which the stump of the nerve was situated. The observations were made in a room almost completely dark. Of six persons, in two pressure on this spot always caused a flash of light on the side of the enucleated eye. One of them averred that the sensation exactly resembled that which he had before experienced when the eyeball was galvanized. The same patients experienced a similar sensation when the stump of the nerve was galvanized. The negative result in other cases may be explained by more complete atrophy of the nerve, or greater retraction of the stump. These positive observations seem to establish conclusively the mechanical excitability of the optic nerve. —*Lancet.*

Prizes for Farmers' Boys.

The prizes won by Vermont boys last year in competition for the awards offered by the University of Vermont and State Agricultural College, through the generosity of ex-Gov. Smith, have been declared. The conditions of the trial were the same as those of the former trial in 1880, and show a substantial advance, the first prize winners obtaining 5 bushels more of corn and 60 bushels more of potatoes to the acre than the best of the former year's figures. Twenty-five young farmers obtained yields of over 80 bushels of corn and over 250 bushels of potatoes to the acre, and the yields range from these figures up to the really remarkable ones of 127 bushels of corn and 552 bushels of potatoes to the acre! The latter result, at the prices obtained for potatoes last fall, would represent a return of over $300 per acre. The first prize on corn was won by Thomas B. Purdy, of Manchester; the first on potatoes, by Frank C. Ayer, of Goshen.

© 1882 SCIENTIFIC AMERICAN, INC

Public Works in New York City.

The annual report of the Commissioner of Public Works shows that the department was conducted during the past year for much less than half the expenditure of 1871, notwithstanding the large increase in area and population. The amount disbursed was $3,654,523. The drought of last year and the near approach to a water famine naturally led to plans for increasing the water supply of the city. That of the Chief Engineer of the Croton Aqueduct is to construct a dam across the Croton near its mouth, thus embracing the entire discharge of the watershed and adding about twenty-three square miles to the existing drainage area. The reservoir or lake formed by this dam would cover an area of over 3,600 acres, and would contain available storage to the amount of about 32,000,000,000 gallons, sufficient to supply the conduit with 200,000,000 gallons a day for 160 days, without recourse to the flow of the Croton. From this reservoir an aqueduct, mainly in rock tunnel, would be run to the Harlem River, and thence to the Central Park reservoir. With the aid of Mr. E. S. Chesbrough, consulting engineer, this plan has been worked out. The estimate made early in the season for constructing this work on the basis of a conduit of 150,000,000 gallons daily delivery was $12,000,000. Subsequent investigation has shown that the work could be executed within that estimate. The plan now proposed, however, contemplates an aqueduct of about 250,000,000 gallons daily capacity, and the estimate for the construction is $14,000,000.

Alluding to the subject of preventing waste of water the report says that during the year, 1,291 additional water meters were placed, making a total of 5,293 in use at the close of the year, distributed as follows:

	No. of Meters.	Gallons of Water Used per Day.
Hotels	327	1,444,900
Breweries, malthouses, etc.	269	1,187,200
Charitable institutions	85	417,000
Offices	1,542	1,395,500
Factories	234	851,400
Gas works	32	713,700
Railroads	169	1,131,100
Stables	1,238	969,500
Apartment houses	54	188,700
Docks	100	1,354,000
Miscellaneous	1,243	2,272,400
Totals	5,293	11,925,400

Nine and one-tenth miles of pipe were laid to extend the distribution of Croton water, and 449 fire hydrants were placed during the year. The distributing system now comprises 512 miles of pipes, with 5,427 stop-cocks and 6,496 fire hydrants. The general disposition to use water in a lavish or wasteful manner is shown by the large consumption in the high-service districts. During the year 4,236,000,000 gallons of water were pumped and distributed from the high-service works, being 11,600,000 gallons per day, supplying 7,492 dwellings, 444 factories, 83 stables, and 588 schools, churches, asylums, and other institutions. This is an average of 1,347 gallons per day for each building, and an average of 100 gallons daily per capita. At this rate the consumption for the entire city would be at least 125,000,000 gallons per day, while the actual supply which the aqueduct is capable of delivering is a little over 95,000,000 gallons per day.

At the close of the year there were 23,521 public lamps in use in the streets, avenues, public parks and places of the city, including 55 electric lights on Fifth avenue, Broadway, Thirty-fourth street, Fourteenth street, Union square, and Madison square. Seventeen million one hundred and sixty-nine thousand six hundred cubic feet of gas was used in public buildings, offices, markets, and armories under the charge of the department. The eight public baths which were open from June 1 to September 30 were used by 2,381,209 males and 1,117,323 females. An additional bath will be ready for use next season.

During the year 33,131 lineal feet or 6·27 miles of sewers, 487 lineal feet of culverts, and 21 receiving basins were built, making the present extent of the sewerage system on Manhattan Island 387·07 miles, with 4,595 receiving basins. The entire expense for caring for these sewers was $115,979 77.

The two most important works completed during the past year are the large collective sewer on West street, from Spring street to West Eleventh street (very nearly finished), and the deep sewer on Fifth avenue, between Fifty-fifth and Fifty-ninth streets.

The area of new pavements laid during the year is put down as 324,950 square yards, covering 15·7 miles of streets —an increase of 80,143 square yards over the amount of pavements laid in 1880. The present extent of paved streets on Manhattan Island is 340½ miles, of which 70½ miles are cobblestone, 244 miles granite and trap block, 25½ Macadam, and one-half mile asphalt. The aggregate length of streets regulated and graded during the year is given as 2½ miles.

A large part of the report deals with the difficulties encountered in the maintenance of the pavements. These all arise from the number of underground structures in the streets, the full extent of these structures being 1,789·58 miles, divided as follows: Sewers, 383 miles; water mains, 512 miles; gas pipes, 885 miles; steam pipes, 1 mile; pneumatic tubes, three-quarters mile; telegraph tubes, 1¼ miles; and electric light wires, 7 miles. The following permits for laying pipes have been granted in pursuance of action of the Common Council: The Edison Company, 10·8 miles; United States Heating and Power Company, 5·6 miles; New York Steam Company, 1·5.

Swedish Matches.

During the past year, says a correspondent of the London *Grocer*, one factory alone has exported from Sweden 22,000,000 skalpunds of matches. This was the famous factory at Jönköping, known all over the world by the name of "Jönköping's Tändstickor Fabrik." The factory is one of the prides of the country, for not only is it representative of what is rapidly becoming an important Swedish industry, but the distinctiveness of its products has given it a certain international importance.

Its origin dates from the year 1845, when a well-known chemist, named J. E. Lundström, started a small manufactory in Jönköping for the production of the ordinary phosphorus matches then in use. The undertaking was a successful one, and Lundström was enabled to devote his leisure to inquiries and experiments having for their object the improvement of matches. The great question at that time agitating the scientific world was how to make matches safe in their use, not only as far as their explosiveness was concerned, but also in connection with the poisonous properties of the ordinary or white phosphorus which was the principal ingredient in these primitive matches. In 1846 the Austrian chemist Preshel produced a new kind of match, which, by reducing the quantity of chlorate of potash in its composition, he rendered no longer detonating. The poisonous exhalation, however, yet remained. In 1847 Dr. Schrötter, Secretary to the Imperial Academy at Vienna, pointed out in the course of a chemical work, that Emile Kopp, of Strasburg, had three years previously discovered the red or amorphous phosphorus, and asked whether so innocuous a substance might not advantageously be substituted for white phosphorus. The suggestion was lost to the world for a time. Some years afterward, however, the work of Schrötter fell into the hands of Lundström; and the latter was so struck with the feasibility of this theory that he immediately set about attempting to realize it. In 1853 his experiments were crowned with success. He manufactured matches with red phosphorus, which were doubly safe. In the first place they were matches of the kind known as "safety," only lighting on the box; and in the second place, in order to prevent a consumption of phosphorus which might be injurious, the phosphorus was placed, not on the match, but on the friction surface of the box. Thus Lundström matches are "safety" in more ways than one: they have nothing in them of an explosive nature, and both in the factory and in the house of the consumer they are not in the slightest degree calculated to affect health.

As may be imagined, this invention of Lundström gave a great stimulus to the development of his factory. Soon a new and more spacious site was selected for the erection of an establishment on a larger scale, situated north of Lake Wettern, and with easy communication by rail. Since 1857 the factory has been in the hands of a company, composed of 11 shareholders, with a capital of 4,000,000 kronor. The number of hands employed is 872, of whom 533 are men and 339 women. During the past year 202,841,070 matches have been made in this one establishment, the weight being 66,416 centner, and the aggregate value 2,806,744 kronor. Eight steam engines, of about 119 horse power, are employed in the factory, by which 250 different working machines are set in motion. The precautions against fire are so efficiently carried out that the buildings are insured for comparatively low premiums. The Jönköping matches are made out of ash sticks, which are carefully assorted and sawn into blocks of about one foot and a half long. After removing the bark, they are laid for a certain time in water, to render the wood both tougher and more pliable. Subsequently, the blocks are cut by machinery into thin laths from 12 feet to 15 feet long, of the same thickness and width as the breadth and length of the matches. By the next process the laths are packed together in bundles of about 50 in a machine which produces match sticks at the rate of 1,000,000 per hour. They are finally dried by warm air, dipped in the igniting composition, and packed in boxes, which are mostly made by prisoners in the jails of the city of London.

It is worth remarking that the comforts and welfare of the workpeople in the factory are by no means forgotten. Dwelling places, schools, and reading rooms have been erected on the premises for their sole use, and a fund has been established by the shareholders, to which the factory people contribute a small sum, and become thereby entitled to help in case of sickness or infirmity. I may mention that Lundström's formula for the manufacture of his matches consists of a mixture of chlorate of potash, sulphate of antimony, and gum arabic for the matches, and a similar mixture, but with red phosphorus, for the friction surface in place of the chlorate of potash.

Lead.

Lead, symbol Pb, combining weight 207, is usually obtained from an ore called galena, which is a sulphide, by a process of roasting. It is a soft blue metal, easily scratched, even by the nail; it is very malleable, but possesses but little tenacity. Lead melts at about 600° Fah., and passes into a vapor at a white heat. Its specific gravity is 11·4, and it is therefore one of the heaviest of metals. It is but little affected by the atmosphere, as the thin film of oxide which first forms serves to protect the metal from further change. The action of water upon lead is also rather remarkable. Pure waters containing but little saline matter attack lead and dissolve a portion of the metal, while hard waters containing considerable quantities of sulphates and carbonates have no appreciable action on lead, because they form on its surface a deposit which effectually prevents all solvent action.

As all lead compounds are very poisonous, great care should be taken, says the *Brewers' Guardian*, to prevent contamination with this metal, and soft waters should not be allowed to pass through leaden pipes or be stored in lead-lined cisterns. Lead combines with oxygen in several proportions. The protoxide PbO, commonly called litharge, is largely used in several industries, but has no direct interest for brewers. The dioxide PbO_2 is even of less importance, but an intermediate oxide having the composition Pb_3O_4 possesses a fine red color, and is largely used as a pigment, and is known as the red lead of commerce. None of the salts of lead require detailed description. We may, however, just mention a compound of the carbonate and the hydrate known as white lead, which is very extensively used as a pigment, not only for the purity of its color, but also for its great opacity, which quality causes it to be used in combination with other paints when great "body" is required. The great objection to lead compounds as pigments is, that they always blacken on exposure to air, as the atmosphere, especially in the neighborhood of large towns, contains traces of sulphureted hydrogen, and for this reason zinc-white is now largely substituted for white lead.

Tests for Lead.—The characteristic test for lead in solution is the production of a black sulphide on addition of sulphureted hydrogen, this sulphide being insoluble in dilute acids. Hydrochloric acid gives a white precipitate of plumbic chloride in not too dilute solutions, and iodide of potassium gives a very brilliant yellow precipitate of iodide of lead. Sulphuric acid produces a dense white precipitate of plumbic sulphate, which is very insoluble. In the dry state the presence of lead may be detected by the easy reduction of the metal in the form of a malleable bead, when a little of the substance is heated on a piece of charcoal before the blowpipe flame. In testing waters for lead contamination they must first be acidified with a drop or two of hydrochloric acid, and then a little saturated solution of sulphureted hydrogen added, or, what is still better, a current of the gas should be passed through the water, when, if the slightest trace of lead be present, a brownish tinge will be apparent, and if much lead be present a black precipitate of sulphide of lead may even separate.

Michigan Metals.

A comparatively small, narrow part of the State of Michigan, skirted its whole extent on the north by Lake Superior, and on the south, in large part, by Lakes Michigan and Huron, and known as the upper peninsula, in little more than a quarter of a century, has contributed to the realized mineral wealth of the country nearly $300,000,000 in ingot copper, pig iron, and iron ores. Of this immense product, the iron mines have furnished nearly $130,000,000. Last year the copper product was in value about $10,000,000, and the iron about $18,000,000, making a total of $28,000,000, while the promise for 1882, both for copper and iron, is that the product will be greater. A pretty good showing for a strip of wilderness, and there is to-day more iron in sight than ever before, more new mines than old ones, and more iron territory remaining to be opened and explored than has been explored up to this time, three acres to one.—*Mining Record.*

Muriate of Pilocarpine in Whooping Cough.

According to Albrecht, the muriate of pilocarpine, when given at a sufficiently early period, never fails to cut short the most serious stages of whooping cough, namely, the period of suffocative attacks, although the duration of the disease as a whole is not materially shortened thereby. The formula recommended is pilocarpin. muriatic., 0·025 grm.; cognac f. champ., 5 grms.; syrup. cort. aurant., 25 grms.; aq. destill., 70 grms.; of which mixture a teaspoonful up to a tablespoonful should be administered after every paroxysm, the dose varying with the age of the patient. The remedy acts very promptly, as may be demonstrated by laryngoscopic examination, which discloses a more profuse watery secretion and abatement of the inflammatory appearances in the mucous membrane. The drug should be discontinued as soon as the paroxysms attain a catarrhal character, but should be renewed whenever suffocative attacks recur.—*Allgemeine Medicinalzeitung.*

An Item in Cable Work.

The following is taken from the *Times of India:* "During the repairs of the telegraph cable near Bombay, the steamers Chiltern and Great Northern were about half a mile apart, the former having hold of a shore end cable, and so was in telegraphic communication with Bombay; the latter having hold of a sea end, and so was in telegraphic communication with Aden. The Chiltern desired the Great Northern to splice on to the cable end held by the latter, and pay out three-quarters of a mile of cable, and this was communicated by wire from the test room of the Chiltern, passing through all the coils of cable in her hold and on to Bombay, whence it was sent on to Aden, and back from Aden to the Great Northern. Thus, as a speedy means of sending a message half a mile, it was forwarded by a route between three and four thousand miles long. The following morning, when the vessels were within a quarter of a mile of each other, communications passed between them constantly in the same way."

© 1882 SCIENTIFIC AMERICAN, INC

ENGINEERING INVENTIONS.

An improvement in traction-rope railways has been patented by Mr. Samuel H. Terry, of Guthrie, Mo. The invention relates to traction-rope railways, and it consists in certain improvements in the invention for traction rope railways for which a previous application for Letters Patent was filed by the same inventor. The improvements consist, first, of a series of friction rolls for the traction rope, secured to and arranged on one side of removable sections of the gutter, said sections being provided with suitable openings arranged in connection with covered basins or wells in the street, whereby an open channel without obstructions on one side is formed, and the refuse matter in the gutter may readily be swept into the covered basins and removed therefrom, the covered basins being connected preferably with a sewer or water-way, and the sections maybe removed when necessary to adjust said rollers, or for other purposes.

Mr. James Manes, of Baltimore, Md., has lately patented a novel machine for the purpose of extracting gold and silver from their ores or from tailings, which consists, mainly, in a series of metal cylinders placed horizontally and made cone-shaped or tapering, so as to be larger at one end than at the other, the said cylinders being provided at their large ends with detachable heads, and being arranged with the large end of one above the small end of the other, and the cylinders being connected by spouts arranged alternately at opposite ends, so that the ore travels by gravity down to the larger end of the cylinder and enters the smaller end of the next subjacent cylinder, and in each of which cylinders is arranged a rotary shaft bearing mullers, brushes, or other devices for pulverizing, stirring, and mixing the ore with mercury or other chemical as it passes through the machine. The invention also consists in combining the cylinders, brushes, and an outer casing with a steam-heating device for regulating the temperature according to the requirements of the case.

An improvement in car brakes has been patented by Messrs. William Augustus Kearney and Joseph George Davis, of Logansport, Ind. In this device a lever carrying a pawl moves a ratchet wheel fixed to a shaft carrying a peculiar shaped cam, which works the brake chain in such a manner as to quickly take up all slack and then apply great force for operating the brakes. A pawl under control of the foot holds the brake on.

A spark arrester of that kind located in the smoke box of the boiler, or in the space between the ends of the tubes of the boiler and the smoke stack, has been patented by Messrs. Geo. W. Moore and Abraham O. Frick, of Waynesborough, Pa. It consists in arranging within the smoke box a perforated and ribbed deflecting plate extending from the tube sheet in a nearly horizontal but slightly dipping direction to nearly the back end of the smoke box, and combining therewith a second deflecting plate which rises beneath the same from the bottom of the smoke box to nearly the ribbed and perforated plate, and leaning also to the back of the boiler. The lower plate is made adjustable, either bodily or on a pivot, whereby it may form either a receptacle for containing the sparks or is made to create a continuous circulation of sparks in the smoke box.

A novel snow plow has been patented by Mr. Horace Resley, of Cumberland, Md. This invention relates to improvements on a snow plow patented by the same inventor October 10, 1876, No. 183,207, in which is shown a scoop having a slight vertical adjustment and bearing a swinging deflector and vertical cutters, with a supplementary removable plow arranged above said parts. In the present device the inventor has dispensed with the supplementary plow and vertical cutters, and has made several important improvements relating to the scoop.

An improvement in tanks for the storing of petroleum has been patented by Mr. George W. King, of Georgetown, D. C., on the patent No. 234,291, granted to the same inventor November 9, 1880. The present invention covers several features of improvement upon that patent, which consist in means for automatically causing the pan or lid to rise in case of fire and close the tank; in means for preventing the charging of the tank and its contents with static electricity of different polarity, and thus obviating any static discharge which would ignite the inflammable gases; in the peculiar construction and arrangement of an automatic cut-off in the filling pipe of the tank, which cut-off is controlled by the movement of the rising and falling pan; in the peculiar form of the lid or pan; in the combination, with the lid or pan, of a supplemental float attached to the bottom of the pan; and in the peculiar means for equalizing the movements of the pan.

The Naval Defenses of England.

Those who complain of the inefficient condition of our navy, and who think that Great Britain is far ahead of us in point of naval defense, should read the late address of Sir W. G. Armstrong, before the Institution of Civil Engineers. It is given in full in our SUPPLEMENT 322. Sir William refers to certain light unarmored ships lately built in England for foreign powers, which, with a displacement of only 1,300 tons, have attained a speed of 16 knots an hour, and are able to steam 4,000 miles without replenishing coal. They are armed with two 10-inch guns capable of piercing 18 inches of iron armor. He further states that there is not at present a single ship in the British Navy, that carries an armament competent to engage them, that could overtake them in pursuit, or evade their attack when prudence dictated a retreat.

Gas Engine Patents in England.

It will be remembered that last year Messrs. Crossley, of Manchester, sued, through Mr. Otto, a Mr. Linford, the maker of a gas engine which Mr. Otto asserted was an infringement of his invention. The case was argued at great length before Vice-Chancellor Bacon, and he decided for the defendant Linford, and thereupon Otto appealed. This appeal lately came on for a hearing before the Master of the Rolls and Lord Justices Brett and Holker. The evidence taken at the trial was before the Court, and counsel were heard on both sides. The result of the appeal has been to reverse the decision of Vice-Chancellor Bacon; and an injunction has been granted to restrain Mr. Linford from making or vending gas engines. This decision, says the *Engineer*, has a far wider range perhaps than appears at first sight. For some years great attention has been devoted to the invention and making of gas engines; within the last two years especially something like two hundred and fifty patents have been granted for improvements in this class of machinery. There are several firms employed in their manufacture. Should it be found that these engines come within the decision of the Court of Appeal, the practical result will be that Messrs. Crossley will enjoy a monopoly of the construction of gas engines for several years to come. In a word, the verdict of the Master of the Rolls and his two brother judges may be found to affect a very large amount of capital, and even to deprive inventors, who have worked hard and successfully, of the fruits of their labor. We do not say that it will. That is a question which remains for discussion.

The Court of Appeal has interpreted Otto's specification with great care; and no doubt exists as to what the judges, at all events, hold that it means. This is a great gain—it clears the ground. According to the Master of the Rolls—his fellow judges concurring—Otto patented the idea of producing a gradual explosion in the cylinder of a gas engine, and the means of applying the idea in practice. It was urged by Linford, be it understood, that Otto's patent was bad. The Court hold it to be good on two points, but these cover much. To explain them it is necessary to say that Otto secures the end he has in view by introducing first air, then a mixture of gas and air, into the cylinder, compressing the whole and igniting the mixture. In this way he claims that he gets a quiet or gradual explosion; but it is not quite clear to us how the result is brought about. A comparison was drawn with precision by Lord Justice Brett between Lenoir's engine and that of the plaintiff Otto. It was alleged by the defendant that Lenoir's engine was an anticipation of Otto's. From this view his lordship dissented. He deduced from Johnson's—Lenoir's—specification that Lenoir rather wanted to produce a violent explosion than the reverse; and that for this, among other reasons, it was not an anticipation. Otto says, according to the Master of the Rolls, "I am going to turn that which was a sudden explosion of gas," as in Lenoir's engine, "into a gradual explosion of gas, and I am going to do that by the introduction of what Otto calls a cushion of air in one place between the piston and the combustible mixture."

The Cost of European Governments.

A recent British Parliamentary report gives a comparative statement of the revenues of several European States, from which it appears that Austria (not including Hungary) has direct taxes of £7,762,553; indirect ones of £21,406,978, and miscellaneous ones of £4,726,447, or a total tax of £33,895,979 (about $167,429,500) for a population of 22,132,684 souls, which is more than $7 for each man, woman, or child. Hungarians are somewhat better off, the total taxes being £19,965,263 (about $99,826,000) and the population 15,608,723—say $6.50 per person. But the Austrians and Hungarians are taxed much less heavily than their neighbors in Prussia, where the total is £56,421,875, and the population 27,251,067—showing an average of about $10 per person. The French are still worse off. The totals for them are £107,303,975 of taxes and 36,905,788 of population, or about $15 of tax per head. This the people of Belgium, a neutral country, free from wars and Nihilism, nearly equals, their showing being, taxes £14,911,502, and population 5,476,939. Better off than any of these people are the Russians—or apparently so, one should say, for the burden of a tax lies not so much in the amount of it as in the inability to pay it. The Russians pay £60,362,731 in taxes, several millions more, that is, than the Austria-Hungary people, or the Germans and Poles of Prussia, but they outnumber their neighbors by tens of millions—the Prussians by 45,000,000, the Austria-Hungary races by 34,000,000. For these $300,000,000 of Russian taxes there are 72,692,000 people among whom to divide them. Thus every European Russian pays a tax of $4, while every Frenchman pays some $15, and yet Russia is internally the most disturbed great country in Europe, and France the most peaceful.

An Agate Forest.

The workmen on the Denver and New Orleans Railroad, while within from twenty to twenty-five miles of Denver, Col , between Cherry and Running creeks, encountered a somewhat remarkable obstruction to their further progress, consisting of a buried forest. The trees are all petrified and agatized, of various sizes, and are buried at depths of from ten to twenty feet, as deep as the men found it necessary to go. These trees were met in half a dozen localities, are very perfect, and if proper machinery was used could be unearthed nearly or quite whole.—*Northwestern Lumberman.*

Collapse of a Large Gasholder.

The Newark *Daily Journal* gives the following account of the collapse of the gasholder belonging to the Citizens' Gaslight Company, on the evening of January 31st ult.:

About seven o'clock it became evident to those in charge of the works of the Citizens' Gaslight Company on Front street, that the iron frame which held the gasholder was giving way. Two of the columns were cracked, and the fierce gale which was blowing caused the iron frame to bend and twist, so that at every moment the structure was expected to go down. Mr. Andrew A. Smalley, the president of the company, was sent for, and he immediately stationed men at each end of the street to warn those who might intend to pass of the danger. Several families residing in the neighborhood left their houses and some prepared to remove their furniture. The gasometer was 97 feet in diameter, with a capacity of about 300,000 feet, and was about one-third filled. The gas was being drawn off and transferred to another holder, when, a few minutes before nine o'clock, the structure went down, and as it fell, with a hissing sound, a column of flame more than 50 feet shot in the air. People were momentarily blinded with the sight. Women became frantic, and even some men thought for a moment that the day of judgment had come. The flame was visible only for a minute, and then the whole portion of the city north of the canal was left in total darkness. The fire department turned out, but there was no occasion for their services. No person was injured, and, with the exception of the blistering of the paint on the cupola of Ballentine & Sons' brewery, no building received any serious damage.

Mr. Smalley stood in a doorway within 30 feet of the gasometer when it fall, and he remained there. He says he had no fear. He believes the flame was caused by the gas being ignited from sparks struck from the iron frame when in falling it crashed against the sides of the tank. The gasometer was torn and rent like a great balloon cut in pieces. There was no explosion; it was simply a collapse. About 20 feet of the wall along Front street is broken down, and 10 feet of the coping thrown from the side wall. Beyond the destruction of the gasometer and frame this is all the loss the gas company has sustained, except the loss of gas and custom. The damage is estimated at $20,000. The tank is uninjured.

The gasometer was erected about thirteen years ago. The columns, which were of cast iron, show numerous old cracks and flaws in the iron, indicating that the contractor had done his work very imperfectly. There were no braces or stays at the base, and, considering the bad material and the careless construction, it now seems strange that the structure stood as long as it did. Gasometers are strengthened at the base of the columns with extra braces of wrought iron.

Connection with the mains of the Newark Gaslight Company has already been made, and Mr. Smalley promises that to-night no part of the city shall suffer from want of gas. Fortunately the new gasometer in Orange is ready for use, though it has not yet been used.

About sixty days will be required in which to rebuild the gasometer. The columns are always kept ready by the contractors, and they will be put up immediately. The main delay will be in building the holder.

Harrison was brightly illuminated by the burning gas. At the time a number of firemen were in the engine house, and they hastily made a start to roll the apparatus before they discovered their error.

The flame from the gas was witnessed by many residents of Roseville, Orange, Montclair, and many other elevated suburban places. It burst upon the stormy sky in a broad red glare, and seemed like an enormous cloud sweeping with lightning rapidity at the houses. Many women were frightened, as even at two miles distance the flame seemed to dart at the windows, and during a moment rooms in which no lights were burning were brilliantly illuminated. The time during which the flames were seen could not have exceeded one minute. They disappeared as suddenly as they came.

A Fly-Wheel Cat.

A white cat which was about Winchester's shop was missed recently. In the forging department of the drop shop is an upright engine where the blowing is done for the forges. The other morning the man started his engine, and looking about the wheel he noticed something on the fly-wheel. The wheel was making a great number of revolutions per minute—going so fast that the spokes were invisible. He did not make out what it was, but paid no particular attention to it, as he thought it was the sun shining on the wheel. Glancing that way occasionally, he noticed the same thing several times. He started the engine at 7 o'clock, and at about 9:30, noticing the object again on the wheel, he thought he would stop the engine and see what it was. He stopped it and got over where it was, and found it was a white cat clinging to the wheel. There the cat had been hanging on for two and a half hours. He took the cat down, and it had become cross-eyed. He put the cat in a box and cared for it, and in about two or three days it began to get around and its eyes commenced to have their natural look. In about a week it came to the room of the foreman, J. D. Eager, a branch of the forge department. Mr. Eager fed it and commenced to train it. The animal reciprocates the kindness shown, remaining about the forge all the time and evincing quite an interest in the business, and is quite a pet among the workmen. The above is a fact.—*New Haven (Conn.) Journal and Courier, February 6.*

© 1882 SCIENTIFIC AMERICAN, INC

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Large Brick Foundry, Machine and Boiler Works, doing good business, for sale. Address J. P. Dennis & Co., Sioux City, Iowa.

Penfield Block Co., Lockport, N. Y., want Florists to send for samples Painted Pot and Tree Labels.

An Electrician, with large experience and the best of references, is open for an engagement. Address "Electrician." 590 Pacific St., Brooklyn, N. Y.

Horizontal Engine, 20 in. cyl. by 48 in. stroke, for sale new. Atlantic Steam Engine Works, Brooklyn, N.Y.

Abbe Bolt Forging Machines and Palmer Power Hammers a specialty. S. C. Forsaith & Co., Manchester, N.H.

I want cheap method of drying 15 tons sawdust per day. Address Allan Sterling, Room 52, 35 Broadway, N.Y.

Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

The Newark Filtering Co., of Newark, N. J, are filling orders from cities and manufacturers for their "Multifold Filters."

To Stop Leaks in Boiler Tubes, use Quinn's Pat. Ferrules. Address S. M. Co., So. Newmarket, N. H.

Light and Fine Machinery and Tools to Order. Lathe catalogue for stamp. Edward O. Chase, Newark, N. J.

Malleable and Gray Iron Castings to order, by Capital City Malleable Iron Co., Albany, N. Y.

For Power & Economy, Alcott's Turbine, Mt. Holly, N. J.

Combination Roll and Rubber Co., 27 Barclay St., N. Y. Wringer Rolls and Moulded Goods Specialties.

Send for Pamphlet of Compilation of Tests of Turbine Water Wheels. Barber, Keiser & Co., Allentown, Pa.

Presses & Dies (fruit cans) Ayar Mach. Wks., Salem, N.J.

Latest Improved Diamond Drills. Send for circular to M. C. Bullock, 80 to 88 Market St., Chicago, Ill.

Wood Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

"How to Keep Boilers Clean," and other valuable information for steam users and engineers. Book of sixty-four pages, published by Jas. F. Hotchkiss, 84 John St., New York, mailed free to any address.

Peck's Patent Drop Press. See adv., page 94.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Supplee Steam Engine. See adv. p. 93.

List 27.—Description of 3,000 new and second-hand Machines, now ready for distribution. Send stamp for same. S.C.Forsaith & Co., Manchester, N.H., and N.Y.city.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y.

Improved Skinner Portable Engines. Erie, Pa.

Lightning Screw Plates and Labor-saving Tools, p. 93.

Cope & Maxwell M'f'g Co.'s Pump adv., page 108.

The Berryman Feed Water Heater and Purifier and Feed Pump. I. B. Davis' Patent. See illus. adv., p. 110.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 108.

Saw Mill Machinery. Stearns Mfg. Co. See p. 93.

Safety Boilers. See Harrison Boiler Works adv., p. 109.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. see p.109.

Common Sense Dry Kiln. Adapted to drying of all material where kiln, etc., drying houses are used. See p.108.

4 to 40 H. P. Steam Engines. See adv. p. 108.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for information. C. H. Brown & Co., Fitchburg, Mass.

Ball's Variable Cut-off Engine. See adv., page 124.

Paragon School Desk Extension Slides. See adv. p.125.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

Brass & Copper in sheets, wire & blanks. See ad. p. 124.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Diamond Planers. J. Dickinson, 64 Nassau St., N. Y.

Ajax Metals for Locomotive Boxes, Journal Bearings, etc. Sold in ingots or castings. See adv., p. 125.

Geiser's Patent Grain Thrasher, Peerless, Portable, and Traction Engine. Geiser Mfg. Co., Waynesboro, Pa.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p.125.

For the manufacture of metallic shells, cups, ferrules, blanks, and any and all kinds of small press and stamped work in copper, brass, zinc, iron, or tin, address C. J. Godfrey & Son, Union City, Conn. The manufacture of small wares, notions, and novelties in the above line, a specialty. See advertisement on page 126.

Granville Hydraulic Elevator Co., 1193 B'way, N. Y.

For Leather, Rubber, or Cotton Belting, Linen Hose or Rubber Hose, write Greene, Tweed & Co., New York.

Draughtsman's Sensitive Paper. T.H.McCollin, Phila., Pa.

For Mill Mach'y & Mill Furnishing, see illus. adv. p.124.

Fine Taps and Dies in Cases for Jewelers, Dentists, Amateurs. The Pratt & Whitney Co., Hartford, Conn.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N. Y. Wm. Sellers & Co.

Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

For Belt Studs, Belt Hooks, Belt Couplers, Belt Punches, Baxter Wrenches, write Greene, Tweed & Co., N.Y.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 15,000 Crank Shafts, and 10,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

Skinner's Chuck. Universal, and Eccentric. See p. 126.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

February 7, 1882,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 261 Broadway, corner of Warren Street, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Alarm. See Fire alarm.
Album clasp, A. C. Hafely 253,281
Aluminous cake, manufacture of, T. S. Harrison. 253,377
Amalgamating ores, process of and apparatus for. C. E. Ball..... 253,254
Amalgamator, C. E. Ball..... 253,255
Automatic gate, E. E. Spitler 253,234
Axle box, car, J. N. Smith..... 253,438
Bait hook, K. Müller 253,308
Baling press, P. Wright..... 253,468
Bar. See Grate bar.
Bearing pin or stud for machinery, H. M. Hall .. 253,375
Bed bottom, N. T. Melvin 253,303
Bed bottom, Woods & Curley 253,463
Bed comfort, blanket, rug, etc., C. D. Murdock.... 253,484
Belt, abrasive, Flagg & Gordon 253,196
Belt hook, A. B. Pitkin..... 253,423
Belting, machine for making rubber, J. T. Ridgway 253,428
Bicycles, carrier attachment for, C. H. Lamson... 253,211
Blind hanger, inside, C. M. Young..... 253,469
Blind hooks, machine for making, W. R. Petrie... 253,311
Block. See Chain block.
Board. See Ironing board.
Board from wood pulp, manufacture of, Mason & Wooster 253,403
Body brace, J. W. Anderson..... 253,251
Boiler. See Steam boiler.
Boot heel, revolving, W. Craig... 253,348
Boots and boot boxes, device for supporting, E. H. Slagle..... 253,436
Bottle stopper fastening, Renaud & Stafford..... 253,427
Bottles, etc., means or apparatus for securing or locking up the contents of, J. Betjemann..... 253,261
Box. See Axle box. Jewel box. Letter box. Smoke box.
Brace. See Body brace.
Bracelet, A. Vester.....253,242, 253,243
Brake. See Car brake.
Buckle, suspender, G. R. Kelsey..... 253,394
Button, C. H. Goodwin..... 253,370
Button or stud, J. H. Wright..... 253,467
Buttons, etc., composition for, T. Guilford..... 253,200
Can, J. Simpson..... 253,318
Can opener, F. Sharp..... 253,432
Car brake, Wilson & Snyder..... 253,249
Car brake, automatic, C. W. Lanpher..... 253,398
Car coupling, M. Herrens..... 253,204
Car coupling, A. Leyden..... 253,399
Car coupling, J. F. Wallace 253,246
Car heater, J. Johnson..... 253,389
Car heater, railway, W. C. Baker 253,253
Car, stock, G. F. Oehrl..... 253,418
Car ventilator, E. O. Connors..... 253,188
Car window screen and blind, I. M. Van Wagner. 253,241
Caramel cutter, I. H. Wright..... 253,466
Carburetor, J. Haberstick..... 253,202
Carding machine, G. Bernhart 253,260
Carpet stretcher, M. Winter, Sr..... 253,460
Carriage tops, folding bracket for, C. M. Fogelquist 253,364
Cartridge machine, H. W. Mason..... 253,213
Case. See Spectacle lens case. Watch case.
Case for displaying wares, J. E. Hunter..... 253,290
Casting steel ingots, process of and machine for, G. W. Billings..... 253,176
Chain block, differential, J. D. Davies..... 253,189
Chain link, ornamental, S. Davidson..... 253,351
Chain, ornamental, A. J. Harris..... 253,203
Chair. See Child's chair. Invalid chair.
Child's chair, A. B. Stevens..... 253,320
Chuck, E. Knight..... 253,480
Churn motor, G. C. Quick..... 253,424
Cigar cutter, Marsh & Bedell 253,301
Clamp. See Plow beam clamp.
Clasp. See Album clasp.
Clasp, B. F. Neal..... 253,414
Clip for braid, tape, etc., in rolls, L. B. Goff 253,278
Clock, A. M. Lane..... 253,397
Clock pendulum, A. E. Hotchkiss..... 253,288
Clothes drier, A. Hippchen..... 253,383
Clutch, friction, J. R. Back..... 253,175
Cock for fire engines, relief, J. T. Houchens..... 253,479
Cock, steam cylinder, L. Maxfield..... 253,405
Coffee mill, F. H. Chapman..... 253,264
Coin holder and counter, J. W. Elliot 253,272
Coke ovens, apparatus for extinguishing fires in, J. H. Campbell..... 253,182
Coloring matter or dyestuff, J. H. Stebbins, Jr.... 253,443 to 253,445
Coloring matter to fabrics, application of, A. Sansone..... 253,230
Cooler. See Milk cooler.
Corset, I. W. Birdseye..... 253,341
Counter seat, store, A. J. Culbertson..... 253,349
Coupling. See Car coupling. Thill coupling.
Crank, self-adjusting, W. H. Clark 253,265
Cravats, neckties, etc., fastening for, J. Hinks *et al.* 253,478
Crusher. See Ore crusher.
Cultivator, J. Williams. 253,458
Curtain roller, spring, C. De Quillfeldt (r)..... 10,026
Cuspidor, W. Westlake..... 253,455
Cutter. See Caramel cutter. Cigar cutter. Hog tendon cutter. Sewing machine thread cutter.
Cutter head for wood-working machines, T. Fitzsimmons 253,273
Cyclometer, P. E. McDonnell..... 253,481
Cylinder engine, three, L. Lapyre..... 253,299
Desk, tracing, E. T. Gibson 253,368
Dish drainer, G. B. Wold 253,461
Disinfecting water closets, etc., apparatus for, E. J. Mallett, Jr..... 253,400
Door hanger, W. B. Cogger..... 253,471
Door spring, W. F. H. Amwake..... 253,173
Drawer pull, F. W. Smith 253,437
Drier. See Clothes drier. Fruit drier.
Drill and reamer, combined, F. H. Bultmann 253,263
Drinks, shaker for mixing, L. Ward *et al.*..... 253,451
Ear wire lock, P. K. De Mur..... 253,472
Earth borer and excavator, J. W. Carley (r)..... 10,027
Earthenware cover and handle, C. S. Watkins ... 253,329
Electric machine, dynamo, C. A. Hussey..... 252,387
Electric store boxes and lights, regulator for, H. B. Sheridan 253,435
Elevator. See Hydraulic and pneumatic elevator.
Elevator door, self-closing, T. M. Clark..... 253,345
Elevator guard, automatic, J. F. Abbott..... 253,172
Engine. See Cylinder engine. Gas engine. Paper pulp engine.
Extractor. See Fish hook extractor.
Farm and yard gate, G. W. Foulger..... 253,487
Fermenting malt liquors, apparatus for, M. A. Maus 253,214
Fertilizer distributer, J. M. Westcott 253,454
File cutting machine, F. Foshay 253,197
File stripping machine, F. Foshay..... 253,198
Finger ring, J. H. Sprague..... 253,233
Fire alarm, I. Kitsee 255,297
Firearm, breech-loading, Johnson & Bye 253,292
Firearm, breech-loading, A. Picard..... 253,422
Fire escape, W. Winkless 253,459
Fire extinguisher, I. Kitsee..... 253,298
Fireplace heater, G. D. Sanford..... 253,315
Fish hook extractor, J. W. Foard..... 253,363
Fishing apparatus, M. H. Whitcomb. 253,456
Flour dressing machine, J. Weber..... 253,452
Flues, connecting smoke, hot air, and other, S. O'Brien..... 253,416
Foot protector, H. W. Martin..... 253,402
Frame. See Heddle frame. Quilting frame. Slate frame.
Friction roll, T. M. Chapman..... 253,183
Fruit drier, J. O. Beazley 253,257
Fruit squeezer, W. B. Dean..... 253,353
Furnace. See Hydrocarbon furnace. Locomotive furnace. Smelting furnace.
Furnace, A. C. Felton.....253,191 to 253,193
Furnace attachment, M. F. Wood 253,462
Furnace for burning liquid fuel, F. A. Meyer 253,217
Gas engine, T. McAdoo 253,406
Gas, process of and apparatus for the manufacture of, T. G. Springer (r)..... 10,032
Gate. See Automatic gate. Farm and yard gate.
Glove fastener, W. S. Richardson..... 253,228
Glove, etc., fastening, F. A. C. J. Omlor..... 253,309
Grain cleaning, separating, and grading machine, J. M. Hawley..... 253,380
Grain drill fertilizer distributer, G. D. Baker..... 253,339
Grain, ores, etc., apparatus for pulverizing, L. S. Chichester..... 253,344
Grate, G. Kamp 253,293
Grate bar, H. Miller..... 253,220
Grinding mill, J. T. Obenchain..... 253,415
Grounds, ornamentation of, H. D. Cogswell..... 253,186
Guard. See Elevator guard. Spinning machine tbread guard.
Hair front, E. Mittelstaedt..... 253,412
Hammer, C. J. Grellner..... 253,279
Handle. See Mirror handle. Pistol handle.
Hanger. See Blind hanger. Door hanger.
Harrow, J. H. Barley..... 253,340
Harrow and pulverizer, B. L. Hodgdon 253,384
Harrow and pulverizer, combined, J. Blosser..... 253,342
Harvester, cornstalk, W. I. Ely..... 253,358
Hat bodies, machinery for felting, A. Pelisse.... 253,420
Hatch elevator, automatic, H. R. Tracy..... 253,323
Head covering, R. H. Trested..... 253,448
Heat absorbing apparatus, W. M. Mixer..... 253,413
Heater. See Car heater. Steam boiler beater.
Heddle frame, J. Asbworth 253,335
Hedge, E. H. Fleming..... 253,362
Hemp beater, T. J. Ferguson 253,194
Hemp cleaning machine, T. J. Ferguson 253,195
Hinge, lock, F. Ménard..... 253,304
Hog tendon cutter, O. Ewing 253,359
Holder. See Coin holder. Lath holder. Surgical needle holder.
Hook. See Bait hook. Belt hook.
Hopple, C. J. Gustaveson 253,373
Horse detacher, J. Gassmann 253,367
Hydraulic and pneumatic elevator, H. H. Day (r). 10,031
Hydrocarbon furnace, G. Duryee 253,270
Ice cutting machine, F. L. D. Pearson 253223
Indicator, W. Stephens 253,319
Injector, liquid fuel, F. A. Meyer..... 253,216
Insulation of electrical conductors, H. C. Strong. 253,446
Interlocking switch and signal mechanism, E. H. Johnston 253,391
Invalid chair, folding, W. Armstrong..... 253,333
Iron. See Wagon seat corner iron.
Ironing board, King & Saxton..... 253,295
Jack. See Lifting jack.
Jewel box, G. Gough 253,473
Jewelry, J. B. Van Houten..... 253,450
Joint. See Vehicle top joint.
Journal box, S. E. Pettee..... 253,225
Knitting machines, thread guide mechanism for, Pearson & Bradley 253,224
Lamp, electric, A. G. Holcombe..... 253,205
Lamp, electric, W. M. Thomas. 253,322
Lamp, electric, A. G. Waterhouse.....253,327, 253,328
Lamp for railway cars, etc., C. P. Howard. 253,207
Lamp, inextinguishable self-igniting signal, T. Curtis..... 253,350
Lamps, carbon holder for electric, J. Tregoning.. 253,324
Lantern, F. McLewee..... 253,302
Lath holder, I. Miles..... 253,219
Lathe attachment, H. Richmann 253,314
Lathes, taper attachment for, F. B. Miles..... 253,410
Leather, composition for improving lace, L. Junior 253,210
Leather splitting machine, G. L. Tyler..... 253,449
Letter box, street, S. Strong..... 253,236
Letters, cards, photographs, etc., device for holding, Jones & Middleton 253,392
Lifter. See Pot lifter.
Lifting jack, W. Knightlinger..... 253,294
Lifting jack, F. Lehman 253,300
Link bending machine, E. H. Johnston..... 253,390
Lock. See Ear wire lock. Seal lock. Time lock.
Locomotive, B. F. Hudson 253,289
Locomotive furnace, T. A. Buckland 253,179
Locomotives, cow catcher for, O. P. Johnson..... 253,208
Lubricator, C. H. Harrub..... 253,282
Lubricator, L. Maxfield..... 253,404
Magneto-electric machine, L. Herman..... 253,382
Malt extracts from the refuse of brewers' mash, apparatus for expressing, H. R. Randall..... 253,425
Man power, T. Hill..... 253,286
Mechanical movement, J. W. Reid..... 253,426
Milk cooler, A. H. Brill..... 253,178
Mill. See Coffee mill. Grinding mill. Roller mill.
Mirror handle, P. Wiederer..... 253,457
Motion, system for transmitting, A. Samper 253,429
Motor. See Churn motor.
Musical instrument reed, M. Bray..... 253,262
Necktie fastening, L. Michaux..... 253,409
Nippers, cutting, T. G. Hall (r)..... 10,028
Nut, screw, S. Darling..... 253,266
Oil tank, J. D. Arnold..... 253,334
Ore crusher, H. H. Scoville..... 253,231
Ore grinding mill, W. E. Harris..... 253,476
Ore separating apparatus, concentrator for, J. F. Sanders..... 253,229
Organ and upright piano, combined, W. C. Woodward..... 253,464
Organ, reed, C. Austin..... 253,488
Organ, reed, J. Janes 253,291
Organ, reed, G. B. Kelly..... 253,395
Oven and furnace door, W. H. Strickler..... 253,235
Paddlewheel, feathering, G. F. Freedman 253,277
Paint and other cans and tubes, F. R. Grout..... 253,280
Paper bags, machine for making, E. Stanley 253,441
Paper making, etc., treating wood in order to obtain fiber suitable for, C. D. Ekman..... 253,357
Paper, photographic, G. Eastman..... 253,354
Paper pulp engine, W. E. Taylor..... 253,447
Peg cutting machine, N. S. Wakefield..... 253,244
Pen, fountain, G. F. Hawkes 253,283
Percolator and still, combined, B. Fenner..... 253,360
Piano action, G. Philipp..... 253,421
Pin. See Bearing pin.
Pipes and wires, protecting underground, A. Campbell 253,181
Pistol handle, D. Moore..... 255,221
Plow, Cooper & Lemmon..... 253,347
Plow, E. D. Meagher 253,408
Plow attachment, R. V. Kennedy..... 253,395
Plow beam clamp, J. A. McNeal. 253,407
Plow, shovel, G. A. Agee 253,331
Poke, horse, F. P. Athey..... 253,336
Pot for cooking purposes, J. Dowling..... 253,268
Pot lifter, J. Dowling 253,269
Power. See Man power.
Press. See Baling press.
Printing machine sheet delivery apparatus, S. D. Tucker..... 253,325
Printing press and stereotype casting box, combined, M. J. Hughes..... 253,386
Propeller, pneumatic, A. Maynard..... 253,215
Propeller, screw, J. Belduke..... 253,258
Protector. See Foot protector.
Pump, T. V. Warner 253,247
Quilting frame, H. T. Davis..... 253,252
Railway chair, L. Haas..... 253,374
Railway frog, T. Breen..... 253,177
Railway safety signal, P. C. Bouck..... 255,345
Railway switch, N. Eaton 253,271
Railway tie, C. F. Herbst..... 253,581
Railway trains, apparatus for producing signals and lights upon, E. T. Starr..... 253,442
Rakes, teeth cleaning attachment for garden, Miller & Eason..... 253,307
Rat trap, H. Younger..... 253,470
Razor strop, J. Lamont (r)..... 10,029
Reaper and mower, F. J. Hazard..... 253,477
Refrigerating or ice making machinery, flange union for, W. M. Mixer 253,482
Ring. See Finger ring.
Roller. See Curtain roller.
Roller mill, J. Weber..... 253,330
Roofing tile, T. B. Atterbury..... 253,174
Saddle trees, girth attachment for, W. M. Mann.. 253,401
Sails, reefing, W. N. Griswold... 253,371
Scarf, neck, H. Selvage..... 253,485
Scraper and scoop, combined road, H. H. Messenger..... 253,305
Scraper, road, W. Patterson 253,310
Screen. See Car window screen.
Seal lock, F. P. Iannarone..... 253,388
Seat. See Counter seat. Vehicle shifting seat.
Seeder and cultivator, J. E. Henris..... 253,285
Sewing and other machines, driving mechanism for, T. S. Tongue..... 253,240
Sewing machine, G. F. Newell..... 253,222
Sewing machine, W. Wendell..... 253,248
Sewing machine attachment, J. F. Snediker..... 253,486
Sewing machine guide, J. F. J. Gunning..... 253,372
Sewing machine thread cutter, C. H. Green..... 253,474
Sewing machine treadle, J. D. Lawlor..... 253,212
Shears for cutting flowers, plants, etc., J. S. Badia 253,252
Sheet metal shaping machine, I. Van Hagen..... 253,326
Ship's log, W. S. Hogg..... 253,287
Shirt, J. G. Barker..... 253,256
Shirt, F. C. Mott 253,483
Shoe, turned, W. Comey..... 253,187
Signal. See Railway safety signal.
Slate frame, A. W. Stossmeister 253,234
Sled, C. M. Amsden..... 253,332
Smelting furnace, J. Bell 253,259
Smoke box, water jacket, E. Huber..... 253,385
Smoke filter for pipes and cigarettes, F. S. Kinney 253,296
Sockets, soft metal lining for dovetail, J. A. Sandford 253,430
Sole edge plane, W. F. Bullock..... 253,180
Soluble matter from substances containing it, and apparatus therefor, extracting by volatile solvents, E. B. Hart..... 253,379
Solvents which have been used in extracting soluble matter, recovering volatile, E. B. Hart..... 253,378
Spark arrester G. S. Cook..... 253,346
Spectacle lens case, G. D. Edmondson..... 253,356
Spinning, doubling, and twisting fibrous materials, machine for, F. Seymour..... 253,431
Spinning frame spindles, mechanism for supporting and lubricating ring, W. I. Pinkham..... 253,239
Spinning machine thread guard, H. E. Swift..... 253,321
Spring. See Door spring. Vehicle spring.
Starch, apparatus for the manufacture of, A. Atkinson..... 253,337
Steam boiler, C. J. Galloway..... 253,365
Steam boiler heater and feeder, F. A. Meyer..... 253,218
Steam boilers, cleaning, J. B. Weeks..... 253,453
Steam engine reversing apparatus, W. E. Good... 253,199
Steering apparatus, J. Rees..... 253,226
Store service system, P. Kennelly..... 253,396
Stove attachment, magazine, T. D. Woolson..... 253,465
Stove, cooking, J. A. Horton..... 253,206
Sulky, W. S. Frazier.....253,275, 253,276
Surgical needle holder, G. E. Jones. 253,209
Suspender braces, tab connector for, T. Walker.. 253,245
Switch. See Interlocking switch. Railway switch.
Table. See Telegraph table.
Tacks for use, preparing headed, E. Woodward... 253,250
Tag, S. B. Fleisher..... 253,274
Tank. See Oil tank.

© 1882 SCIENTIFIC AMERICAN, INC

Telegraph apparatus, duplex, J. B. Stearns (r)..... 10,033 to 10,035
Telegraph table, revolving, J. L. Garber..... 253,366
Telegraphs, electric coupling for train. E. D Parker..... 253,419
Telephone exchange system and apparatus. G. B. Scott..... 253,316
Tender and other brakes, D. S. Randolph..... 253,312
Thill coupling, R. J. Mitchell..... 253,411
Tie. See Railway tie.
Tile for plastering, etc., porous penetrable, S. E. Loring (r)..... 10,030
Timber for preserving it. apparatus for the treatment of, H. Flad..... 253,361
Time lock. S. Shaw..... 253,317
Tobacco, machine for attaching tags and labels to plug, E. R. Hearn..... 253,284
Tobacco package, plug, S. C. Shelton..... 253,434
Trap. See Rat trap.
Trees, implement for bleeding, M. Christlmiller.. 253,185
Truck, car, J. N. Smith..... 253,439
Type writer. J. B. Hammond..... 253,475
Valve gear, steam engine. J. O'Donnell..... 253,417
Vehicle shifting seat, J. C. Theakston..... 253,238
Vehicle spring, A. Gummer..... 253,201
Vehicle top joint, H. Rentchler..... 253,313
Vent automatic, F. Messmer..... 253,306
Ventilator. See Car ventilator.
Wagon seat corner iron, D. H. Harris..... 253,376
Washing machine, H. A. Shaw..... 253,433
Watch case centers, device for making, F. Ecaubert..... 253,355
Watch case. rubber, G. Speckhart..... 253,440
Watch. stop, C. H. Audemars..... 253,338
Water wheel, R. N. Davidson..... 253,267
Waterproofing and preservative compound, J. E. Gillespie..... 253,369
Wheel. See Paddlewheel. Water wheel.
Wheel, A. J. Taplin..... 253,237
Whip socket, G. W. Eddy..... 253,190
Wire, manufacture of zinc coated, W. E. Rice..... 253,227
Wire, ornamental, J. A. Charnley..... 253,184

DESIGNS.

Bedstead. A. F. Milne..... 12,744
Carpet, J. Fisher..... 12,734
Carpet. W. J. Gadsby..... 12,753
Carpet. D. McNair..... 12,754
Carpet, T. J. Stearns..... 12,755, 12,756
Clock case, Lincoln & Wesson..... 12,759
Easel, E. L. Moodie..... 12,745
Fringe, Reshower & Heck..... 12,748
Handle for articles of tableware, G. Wilkinson..... 12,757
Jeweler's stand, J. B. Wood..... 12,752
Jewelry, H. G. Mackinney..... 12,735
Lamp, etc., Nichols & McLewee..... 12,746
Oil cloth. C. T. & V. E. Meyer..... 12,736 to 12,743
Panel for mantels. J. Williamson..... 12,751
Rug. carpet. etc.. A. Petzold..... 12,747
Toy for exploding caps and fulminates, C. Coester, Jr..... 12,733
Toy for exploding caps and fulminates, C. F. Ritchel..... 12,749, 12,750
Toy money box, Kyser & Rex..... 12,758

TRADE MARKS.

Baking powder, J. J. O'Brien..... 9,094
Bitters, tonic, C. Spengler..... 9,086
Boots, shoes, and slippers, Ordway & Clark..... 9,085
Buttons, W. Knight & Co..... 9,090
Cleaning and polishing preparations, B. G. Seebach 9,099
Corn starch, T. Kingsford & Son..... 9,084
Hog products, including hams, bacon, pork, lard, and such other food substances as are usually put up by pork butchers and packers, H. Denny & Sons..... 9,079
Leather, Ordway & Clark..... 9,096
Liniment, B. M. Ross..... 9,098
Lozenges for the cure of dyspepsia, indigestion, and kindred diseases, J. N. Hegeman..... 9,092
Medical salt, Stadtgemeinde Karlsbad..... 9,100
Pastilles, asthmatic. E. D. Stowell..... 9,088
Pens, steel and metallic, W. Mitchell..... 9,085
Petroleum, refined, H. W. Peabody & Co..... 9,097
Quicksilver flasks, Quicksilver Mining Company.... 9,101
Sewing cotton and thread. J. Brook & Brothers.... 9,091
Starch. T. Kingsford..... 9,080 to 9,083
Stove and range grates, Spicer & Peckham..... 9,087
Tobacco, cigars, and cigarettes, plug and other kinds of chewing tobacco, smoking, L. & E. Wertheimer..... 9,089
Tobacco, plug and twist chewing, D. A. Martin..... 9,093

THE PLATTSMOUTH BRIDGE.—FULL description of the new and important railway bridge constructed over the Missouri River at Plattsmouth, Neb., from plans by Chief Engineer George S. Morison. Locomotion. General description. Foundations. Masonry. The superstructure. Viaducts. Deck spans. Channel spans. Steel. Floor. Illustrated with eight figures, showing: perspective view of bridge; vertical sections; caissons; piers; and map showing location of bridge. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **285**. Price 10 cents. To be had at this office and from all newsdealers. Another article (illustrated) on the same subject may be found in SUPPLEMENT, No. **27**. Price 10 cents.

PATENTS.

MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine Improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had *thirty-five years' experience*, and now have *unequaled facilities* for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very reasonable terms.

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

We also send, *free of charge*, a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world.

MUNN & CO., Solicitors of Patents,
261 Broadway, New York.

BRANCH OFFICE.—Corner of F and 7th Streets, Washington, D. C.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.
(About eight words to a line.)
Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Reliable Live Canvassing Agents

Wanted for three of the best advertised and quickest selling articles of daily use. No risk. Address **G. A. SCOTT, 842 Broadway, New York.** References: SCIENTIFIC AMERICAN.

13,299 Pages, 15 Vols., $15.

THE

Library of Universal Knowledge,

A REPRINT OF

CHAMBERS'S ENCYCLOPÆDIA,

With **3,500** pages of New and Original American matter added.

40,000 DISTINCT TITLES.

PRICES: Coth, per set, $15; Half Russia, per set, $22.50. Odd volumes at same rates.

9 Pages of valuable information for 1 Cent.

The Best, Cheapest, and Handiest Encyclopædia in the market.
For sale by all booksellers, or sent, postpaid, on receipt of price, by

S. W. GREEN'S SON, Publisher,
74 and 76 Beekman Street, New York.

THE ONLY PERFECT SEWING MACHINE.
SIMPLEST, LATEST IMPROVED
MOST DURABLE & BEST
LIGHT RUNNING
BUY IT AND MAKE HOME HAPPY.
IF THERE IS NO AGENT NEAR YOU WRITE DIRECT TO US.
NEW HOME SEWING MACHINE CO.
ORANGE MASS. 30 UNION SQUARE N.Y. CHICAGO, ILL. ATLANTA GA.

Do You Want a House?

Good Houses.
Cheap Houses.
Prairie Houses.
Farmers' Houses.
Pioneers' Houses.

183 PRIZE House PLANS $250 to $4,000

Nine Large Cash Prizes offered Dec. 1, for best Plans of Country Houses, to cost from **$400** to **$4,000** each, to best combine Economy, Convenience, Comfort, good appearance, etc., etc., brought out **183** different plans from all over the country, **WEST, EAST, NORTH, SOUTH,** and engaged the combined skill of **Architects, Builders, Carpenters, Farmers,** and **Farmers' Wives.** No such concentration of the best effort, talent, and *practical information* as to what is wanted in **FARM HOMES,** to make them comfortable, labor-saving, convenient, and economical, was ever before brought together.

II

Many of the best of all these plans with engravings, elevations, rooms, specifications, materials, instructions for building, etc., will now be published in consecutive numbers of the *American Agriculturist* throughout 1882, and every subscriber will have them.

III

The number for March 1, contains the best **Pioneer's House,** costing $250 to $500, with engravings and all details. That number will be invaluable to Millions of **New Settlers,** of limited means, locating or going West.

IV

Every succeeding number of the *American Agriculturist* will give one or more of the Prize Plans for HOUSES for ALL CLASSES, costing various sums, from $400 to $4,000, and the numbers will be of GREAT VALUE to all wanting a new House, small or large, or to improve Houses already built.

V

Besides the above, the *American Agriculturist* gives a vast amount of Original, Useful, Reliable Information, for every department of Rural and Village life and labor—for the **Farm,** the **Garden,** and the **Household,** illustrated with about **1,000 ENGRAVINGS** annually. Vol. **41** began Jan. 1.

Subscriptions can begin at any time.

TERMS: $1.50 a year. Four copies $5.00. Single numbers 15 cents.

ORANGE JUDD COMPANY, Publishers,
751 Broadway, New York.

PATENTS SOLD

Partners Secured.

Joint Stock Companies formed. Stock placed for Incorporated Companies. Good investments always on hand. Highest references given. Circulars free. E. L. RICHARDS & CO., Brokers, **733** BROADWAY, New York.

CUTLER'S POCKET INHALER

AND

Carbolate of Iodine

INHALANT.

A certain cure for Catarrh, Bronchitis, Asthma, and all diseases of the Throat and Lungs—**even Consumption**—if taken in season. It will break up a **Cold** at once. It is the **King of Cough Medicines.** A few inhalations will correct the most **Offensive Breath.** It may be carried as handily as a penknife, and is guaranteed to accomplish all that is claimed for it.

Patented through the agency of the SCIENTIFIC AMERICAN in 1873, this Inhaler has since had a larger and more extensive sale than any Medical Instrument ever invented.

It is approved by physicians of every school, and indorsed by the leading medical journals of the world.

Over 300,000 in use.

Sold by Druggists for **$1.00.** By mail, $1.25.
W. H. SMITH & CO., PROP'S,
410 Michigan St., Buffalo, N. Y.

The Phosphor-Bronze Smelting Co., Limited,

512 Arch Street, Philadelphia, Pa.

"Phosphor-Bronze"

WIRE ROPES,

For hoisting, transmission of power, standing rigging, tiller ropes, gas machines, etc.

Particulars on Application as above.

OWNERS OF THE U. S. PHOSPHOR-BRONZE PATENTS.
Sole Manufacturers of Phosphor-Bronze in the U. S.

VIOLIN OUTFITS

Consisting of Violin, Box, Bow and Te cher, sent to any part of the United States on 1 to 8 days' trial before buying.

Violin Outfits

at $3.50, $7, $12, & $22 each. Send stamp for **Beautiful Illustrated** 36 page Catalogue of Violins, Guitars, Banjos, Cornets, Flutes, Strings all kinds, Harmonicas, Organ Accordeons, Music Boxes, &c. **LOWEST PRICES.** Mail Orders a Specialty. C. W. STORY, 26 Central St., Boston, Mass.

FOR SALE—BOILERS.

Two Corliss Drop Flue Boilers, each 36 feet long, 4 feet diameter; flues 14 in. diameter. Have been running at a pressure of 80 lb. Price $200 each. Can be seen at 234 West 29th Street, New York.

Rumson Nurseries.

ESTABLISHED 1854.
Now ready: New Catalogue. Descriptive and very instructive. Free to all applicants.
B. B. HANCE, Agt., Bed Bank, N. J.

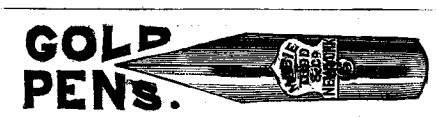
CORRECT TIME!

If you want the Best Time Keeper for the Money that can be bought anywhere in the World, get the

LANCASTER WATCH

Sold by Jewelers throughout the United States. Its 16 grades are not the lowest in price but the best for the money. All Quick-Train ¾ plate Movements. Established 1874. Ask for the **LANCASTER, PA., QUICK-TRAIN RAILROAD WATCHES.**

GOLD PENS.



PENCILS, HOLDERS, CASES, &c.

The CALLI-GRAPHIC Pen.

A GOLD PEN and RUBBER HOLDER, containing ink for several days' writing. Can be carried in the pocket. Always ready for use. A luxury for persons who care to preserve their individuality in writing.

MABIE, TODD & BARD,
180 BROADWAY, NEW YORK.
Send for Price-List.
OUR GOODS ARE SOLD BY FIRST-CLASS DEALERS.

WANTED.—PARTIES TO ASSIST TO MAKE AND handle my Laundry Machinery in New York City.
JESSE POWERS, 77 E. Van Buren St., Chicago, Ill.

Boiler Explosions Easily Prevented at a Trifling Cost.

NOTHING BUT PARSIMONY OR CRIMINAL recklessness prevents steam users owning boilers from attaching the

EDSON SAFETY CAUCES,

which permit the steam to ring one or more gongs at the boiler or elsewhere when the pressure is becoming dangerous, and in time to apply a remedy. The RECORDS would show the FACTS, and go far to PUT THE BLAME WHERE IT BELONGS. They are for sale at
91 LIBERTY STREET, NEW YORK.

Series For 1882.

50 Elegant Imported designs, all Chromos, (xxx board) in beautiful colors, **Gold & Silver, German & French Florals. Scenery** from the **River Rhine, Arctic Scenes, Mossrose Series, Ocean Views, Bird Mottoes,** &c. name in fancy script type, **10c.** or **25** Extra Large size Embossed Chromos, name in any style, **10c. Ag'ts** make **40** per cent. **14** packs of either for **$1.** Our beautiful bound Book of **100** Styles, for 1882, **25c.** Full particulars with every order. Blank Cards at wholesale. **CARD MILLS Northford Ct.**

MINERAL WOOL.

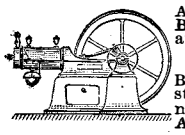
This Fireproof and indestructible material successfully prevents loss of heat by radiation, keeps frost from water pipes, deadens sound, checks spread of fire in walls, partitions, floors of dwellings. 25 cts. per cubic foot.
U. S. MINERAL WOOL CO., 16 Cortlandt St., N. Y.

WOOD WORKING MACHINERY.

PLANING, MATCHING, MOLDING, MORTISING,
TENONING, CARVING, MACHINES.
BAND & SCROLL SAWS
UNIVERSAL AND VARIETY WOOD WORKERS, &c &c.

J. A. FAY & CO.
CINCINNATI, O. U. S. A.

A YOUNG MINING ENGINEER AND Land Surveyor, educated in Scotland, is open to an engagement. Has just completed an engagement with the Tharsis Sulphur and Copper Co. at their extensive copper mines in the South of Spain. Has 7½ years' experience and a thorough knowledge of Spanish. References first-class. Address A. J. G. Ormiston, 17 Dey St., N. Y.



An engine that works without Boiler. Always ready to be started and to give at once full power.
SAFETY. ECONOMY, CONVENIENCE.
Burns common Gas and Air. No steam, no coal, no ashes, no fires, no danger, no extra insurance. Almost no attendance.

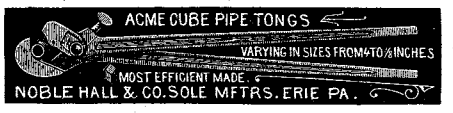
THE NEW OTTO SILENT GAS ENGINE.

Useful for all work of small staticnary steam engine. Built in sizes of **2**, 4, and **7** H. P. by **SCHLEICHER, SCHUMM & CO.,** 3045 Chestnut Street, Phila., Pa. **A. C. Manning,** 38 Dey St., New York, Agent.

NEW BOOKS.

ELECTRIC LIGHTING.—Candle-power of the Electric Light. A comparison of the various Lights, relation of Lighting Power to Quantity of Current, and sources of loss in existing Lamps. By Paget Higgs, LL.D. Crown 8vo, paper, ... $0.75
HYDRAULIC, Steam, and Hand Power Lifting and Pressing Machinery. By F. Colyer, M.Inst.C.E. 73 plates, 8vo, cloth, ... $7.25
LIGHTNING ROD CONFERENCE. Report of the Delegates from the following Societies, viz.: The Meteorological Soc., Royal Institute of British Architects, Soc. of Telegraph Engineers and Electricians, and the Physical Society. With a code of rules for the erection of Lightning Conductors and various appendices. Edited by the Secretary, G. J. Symons, F.R.S. Engravings, 8vo, cloth, ... $3.00
OUR FACTORIES, Workshops, and Warehouses their Sanitary and Fire-resisting Arrangements. By B. H. Thwaite, C.E. 183 illustrations, 8vo, cloth, $3.50
Catalogues and circulars sent free on application.

E. & F. N. SPON,
446 Broome Street, New York.



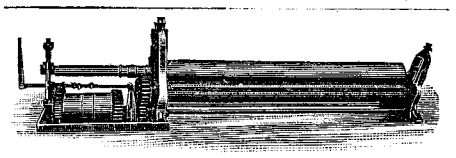
FOR SECOND-HAND ENGINES,

Address HARRIS IRON WORKS, Titusville, Pa.

FOR SALE.

One No. 4 Sturtevant Exhanst Fan, nearly new, perfect order, $75. A Walker Pulverizer, little used, $150; cost $500. PAUL A. OLIVER, Oliver's Mills, Luzerne Co., Pa.

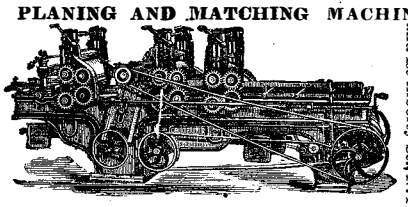
A SMALL STEAM YACHT FOR SALE CHEAP. Address WM. ST'EIN, Blue Island, Ill.



PATENT BENDING ROLLS,
For Heavy Punches, Shears, Boiler Shop Rolls, Radial Drills, etc., send to
HILLES & JONES, Wilmington, Del.

SIBLEY COLLEGE of MECHANIC ARTS, CORNELL UNIVERSITY.
Entrance examinations will be held June 12 and Sept. 11, 1882. For the Register and Catalogue just issued containing reorganized courses of instruction. Scientific and Practical, including Draughting, Machine Construction, General Shop Work, etc., apply to the
PRESIDENT OF CORNELL UNIVERSITY, Ithaca. N. Y.

PLANING AND MATCHING MACHINE.



C. B. ROGERS & CO., Norwich, Conn., and 109 Liberty St., N. Y.
Special Machines for Car Work, and the latest improved Wood Working Machinery of all kinds.

WOOD-WORKING MACHINERY.

Universal Wood Workers, Planing, Matching, Moulding, Band and Scroll Sawing Machines, Carriage, Wagon and Wheel Machinery, etc.
BENTEL, MARCEDANT & CO.,
HAMILTON, OHIO, U. S. A.

PORTABLE POWER DRILLS.
TAPPING, REAMING & BORING MACHINES.
EMERY WHEEL GRINDERS
WOOD BORING MACHINES
STOW FLEXIBLE SHAFT CO. LIM
1509 PENNA. AVE. PHILA. PA.

DRUNKENNESS EASILY CURED.

3,000 Cures with the Double Chloride of Gold Remedy. Books free. LESLIE E. KEELEY, M.D., Surgeon C. & A. R. R., Dwight, Ill., U. S. A.

© 1882 SCIENTIFIC AMERICAN, INC

USEFUL BOOKS
FOR
Mechanics and Amateurs.

Bemrose.—Fret-Cutting and Perforated Carving. With 53 Practical illustrations, 4to, ... $3.00
Bemrose.—Manual of Buhl-Work and Marquetry, with Practical Instructions for Learners. 90 colored designs. 4to, ... $3.00
Bemrose.—Manual of Wood Carving, with Practical Illustrations for Learners of the Art, and Original and Selected Designs. 128 illustrations. 4to, . . $3.00
Bell.—Carpentry Made Easy, or the Science and Art of Framing on a New and Improved System. With specific Instructions for Building Balloon Frames, Barn Frames, Mill Frames, Warehouses, Church Spires, etc. A System of Bridge Building, with Bills, Estimates of Cost, etc. By William Bell. 44 plates, comprising nearly 200 figures. 8vo, ... $5.00
Every Man His Own Mechanic.—A Complete and Comprehensive Guide to every description of Constructive and Decorative Work that may be done by the Amateur Artisan. Illustrated by 750 engravings. 8vo. 816 pages, ... $3.75
Lukin.—Amateur Mechanic's Workshop. Plain and concise directions for the Manipulation of Wood and Metals, including Casting, Forging, Brazing, Soldering, and Carpentry. Illustrated. 8vo, ... $3.00
Lukin.—The Young Mechanic. Practical Carpentry, containing directions for the use of all kinds of Tools, Construction of Steam Engine, Mechanical Models, the Art of Turning in Wood and Metal. Illustrated. 12mo, ... $1.75
Lukin.—Amongst Machines. Embracing descriptions of the various appliances used in the Manufacture of Wood, Metal, and other substances. Illustrated. 12mo, ... $1 75
Lukin.—The Boy Engineers. What They Did and How They Did It. 30 plates. 12mo, ... $1.75
Molesworth.—Pocket Book of Useful Formulæ for Civil and Mechanical Engineers. Full bound pocket book form, ... $1 00
Rose.—The Complete Practical Machinist. Embracing Lathe Work, Vise Work, Drills and Drillings, Taps and Dies, Hardening and Tempering, the Making and Use of Drills, etc. By Joshua Rose. 130 engravings. 12mo, ... $2 50
Vogdes.—The Architect's and Builder's Pocket Companion and Price Book. Consisting of a comprehensive Epitome of Decimals, Duodecimals, Geometry, and Mensuration, with Tables of U. S. Measures, Sizes, Weights, Strength, etc., of Iron, Wood, Stone, and various other materials, Quantities of Materials in different Sizes, and Dimensions of Brick, Wood, and Stone; and a full and complete Bill of Prices for Carpenter's Work; also Rules for Computing, Valuing Brick, Brick Work, and Stone Work, Painting, Plastering, etc. By F. W. Vogdes. Illustrated. Full bound pocket book form, $2.00; cloth, ... $1 50
Watson.—The Modern Practice of American Machinists and Engineers, including the Construction, Application, and Use of Drills, Lathe Tools, Cutters for Boring Cylinder and Hollow Work generally, with the most economical speed for the same; the results verified by actual practice. By Egbert T. Watson. 86 engravings. 12mo, ... $2.50
Watson.—The Manual of the Hand Lathe. Comprising Concise Directions for working Metal of all kinds, Ivory, Bone, and Precious Woods, Dyeing, Coloring, and French Polishing. Inlaying by Veneers, etc. By Egbert P. Watson. 78 engravings. 12mo, . . $1.50

☞ The above, or any of our Books, sent by mail, free of postage, at the publication prices, to any address in the world.

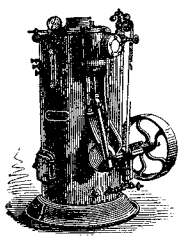
☞ Our large Catalogue of Practical and Scientific Books—96 pages, 8vo—as well as our other catalogues, the whole covering every Branch of Science Applied to the Arts, sent free and free of postage to anyone in any part of the world who will furnish us with his address.

HENRY CAREY BAIRD & CO.,
Industrial Publishers, Booksellers, and Importers,
810 WALNUT STREET, PHILADELPHIA, PA.

OLD RELIABLE.
NO FAILURE IN SIXTEEN YEARS
HEALD & MORRIS, CENTRIFUGAL PUMPS
100 TO 35,000 GALLS PER MINUTE CAPACITY
HEALD & MORRIS, Baldwinsville N.Y.

Geo. W. Read & Co.,
Manufacturers of and Dealers in
MAHOGANY,
And all Foreign and Domestic
Cabinet Woods.
SOLE MANUFACTURERS
CUT AND PRESS DRIED
THIN LUMBER,
FOR
CIGAR BOXES,
Panel Stock, Etc., Etc.

Mills and Warerooms:
186 to 200 Lewis St., New York.



BOOKWALTER ENGINE.
Compact. Substantial. Economical, and easily managed; guaranteed to work well and give full power claimed. Engine and Boiler complete, including Governor. Pump, etc., at the low price of

3	HORSE POWER	$240 00
4½	" "	280 00
6½	" "	355 00
8½	" "	440 00

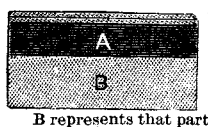
☞ Put on cars at Springfield, O.
JAMES LEFFEL & CO.,
Springfield, Ohio,
or 110 Liberty St., New York.

THE SCOVILL
"Pop" Safety Valve,
SIMPLE. RELIABLE. DURABLE.
For Locomotive, Stationary, Marine, and Portable Boilers.
Send for descriptive circulars and price lists to
THE HANCOCK INSPIRATOR CO.,
BOSTON, MASS.

THE MEDART PATENT WROUGHT RIM PULLEY
THE LIGHTEST, STRONGEST, NO SHRINKAGE STRAINS, PERFECT BALANCE.
THE CHEAPEST PULLEY IN THE MARKET
ANY SIZE OR FACE, STRAIGHT OR CROWNED, TIGHT OR LOOSE, SPLIT OR WHOLE, SINGLE DOUBLE OR TRIPLE ARMS. LARGE PULLEYS A SPECIALTY.
THE HARTFORD ENGINEERING CO. HARTFORD CONN.

$5 to $20 per day at home. Samples worth $5 free. Address STINSON & Co., Portland, Me.

CLARK'S RUBBER WHEELS.
This Wheel is unrivaled for durability, simplicity, and cheapness. Adapted for Warehouse and Platform Trucks, Scales, Heavy Casters, and all purposes for which Wheels are used. Circular and Price List free. GEO. P. CLARK, Windsor Locks, Ct.



RUBBER BACK SQUARE PACKING.
BEST IN THE WORLD.
For Packing the Piston Rods and Valve Stems of Steam Engines and Pumps.

B represents that part of the packing which, when in use, is in contact with the Piston Rod.
A, the elastic back, which keeps the part B against the rod with sufficient pressure to be steam-tight, and yet creates but little friction.
This Packing is made in lengths of about 20 feet, and of all sizes from ¼ to 2 inches square.

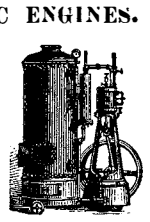
JOHN H. CHEEVER, Treas. **NEW YORK BELTING & PACKING CO.,** 29 Park Row, New York.

SPECIAL NOTICE.—Owing to the recent great fire in the "World" Building, our office has been removed as above.

PAYNE'S AUTOMATIC ENGINES.

Spark Arrester.

Established 1840



Reliable, durable, and economical, *will furnish a horse power with one-third less fuel and water than any other engine built* not fitted with an automatic cut-off. Send for Illustrated Catalogue "A" 2, for information and prices. **B. W. PAYNE & SONS,**
Box 1207. **Corning, N. Y.**

MALLEABLE AND FINE GRAY IRON ALSO STEEL CASTINGS FROM SPECIAL PATTERNS.
THOMAS DEVLIN & CO. FINE TINNING, JAPANNING AND FINISHING.
LEHIGH AVE. & AMERICAN ST. PHILA.

MACHINISTS' TOOLS.
NEW AND IMPROVED PATTERNS.
Send for new illustrated catalogue.
Lathes, Planers, Drills, &c.
NEW HAVEN MANUFACTURING CO.,
New Haven, Conn.

WANTED.—A GOOD SALESMAN WHO thoroughly understands Wood and Iron Working Machinery and Supplies. Must be first-class. Address J. H. KERRICK & CO., Minneapolis, Minn.

ELECTRIC LIGHTS
THOMSON & HOUSTON SYSTEM
OF THE ARCTYPE ESTIMATES
GIVEN & CONTRACTS MADE
631 ARCH ST. PHILADELPHIA PA.

ON 30 DAYS' TRIAL!
We will Send on 30 Days' Trial
Dr. Dye's Electro-Voltaic Belts, Suspensories,
And other Electrical Appliances TO MEN suffering from **Nervous Debility, Lost Vitality,** etc., speedily restoring **Health and Manhood.** Also for **Rheumatism, Paralysis, Liver and Kidney Troubles,** and **many other diseases.** Illustrated pamphlet free. Address
VOLTAIC BELT CO., Marshall, Mich.

MACHINERY
of every description. 121 Chambers and 103 Reade Sts., New York, THE GEORGE PLACE MACHINERY AGENCY.

Hard Rubber.
Manufactured in any desired form by
THE RUBBER COMB AND JEWELRY CO.,
33 Mercer St., New York.
Estimates furnished and correspondence solicited.

HOOVER
DO YOUR OWN PRINTING
Presses and outfits from $3 to $500
Over 2,000 styles of type. Catalogue and reduced price list free.
H. HOOVER, Phila., Pa.

---

150 Elegant Needlework Patterns, for all kinds of Embroidery and Lace Work, with diagrams showing how to make the stitches, 15c., postpaid; 2 sets, 25c. PATTEN & CO., 47 Barclay St., N. Y.

MOSS NEW PROCESS, SUPERIOR SUBSTITUTE FOR WOOD ENGRAVING.
ENGRAVINGS FOR BOOKS, NEWSPAPERS, CATALOGUES, ETC.
MUCH CHEAPER THAN WOOD CUTS
★ SEND GREEN STAMP FOR ILLUSTRATED CIRCULAR.
MOSS ENGRAVING CO. 535 PEARL ST. NEW-YORK. BOX 2
LARGEST ESTABLISHMENT OF THE KIND IN THE WORLD.

ICE MAKING MACHINES, COLD AIR MACHINES,
For Brewers, Pork Packers, Cold Storage Warehouses, Hospitals, etc.
Send for ILLUSTRATED AND DESCRIPTIVE CIRCULARS.
PICTET ARTIFICIAL ICE CO. (Limited),
142 Greenwich Street,
P. O. Box 3083. **New York City, N. Y.**

BEATTY'S Organs, 27 stops, 10 set reeds, only **$90.** **Pianos $125** up. Rare Holiday inducements ready. Write or call on **Beatty,** Washington, N. J.

BATTERIES, WIRES, MAGNETS, INSTRUMENTS, TELEGRAPH AND ELECTRICAL SUPPLIES. CATALOGUE FREE. C. E. JONES & BRO., CINCINNATI, O.

AGRICULTURAL MACHINERY WANTED.
A first-class technical firm in Wallachia (Roumania), with a machine shop for repairing, and extensive business connections, wants agencies of renowned and large manufacturers of Agricultural Machines, Implements, Tools, and Portable Engines. Finest references and security can be given. Address T. S. 2172, c. o. Haasenstein & Vogeler, Vienna, Austria.

SPECIAL MACHINERY, TOOLS, EXPERIMENTAL Work, etc. S. MCHENRY, 927 Filbert St., Philadelphia, Pa. Finework solicited.

SEND TO LONDON, BERRY & ORTON PHILA PA FOR
THE BEST BAND SAW BLADE

WIRE ROPE: THE HAZARD MANUFACTURING CO. CHARLES PARRISH PRESIDENT.

MANUFACTURERS OF
WIRE ROPE, BRIDGE CABLES, SHIP RIGGING,
Tramway Ropes, Champion Barbed Wire, etc.
Office and Works: WILKESBARRE, PA. Send for price list. **Office and Warehouse:** 87 LIBERTY ST., NEW YORK.

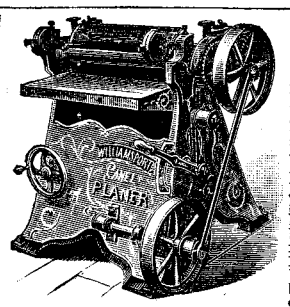
$72 A WEEK. $12 a day at home easily made. Costly outfit free. Address TRUE & Co., Augusta, Me.

THE WALLACE DIAMOND CARBONS.
Telegraph, Telephone, and Electric Light Supplies.

THE ELECTRICAL SUPPLY CO.,
109 Liberty St., New York.

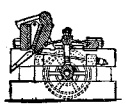
---

50 Elegant Genuine Chromo Cards, no two alike, with name, 10c. SNOW & CO., Meriden, Conn.



WILLIAMSPORT Pony or Panel Planer. For general use in Door Shops, Box and Furniture Manufactories. For planing Door Panels, Cigar Box Stuff, and Furniture work, it has no equal.
We use the Ellis Patent three part Journal Box and a solid forged steel head. Two pressure bars. Has strong feed. Will plane from 1-16 to 6 inch thick. Weight, 1,400 lb. The lowest priced first-class planer in the market. Correspondence solicited.
ROWLEY & HERMANCE, Williamsport, Pa.

"BLAKE'S CHALLENCE" ROCK BREAKER.
Patented November 18, 1879.



For **Macadam Road** making, Ballasting of **Railroads,** Crushing **Ores,** use of **Iron Furnaces,** etc. Rapidly superseding our *older styles* of Blake Crusher on account of its superior *strength, efficiency,* and *simplicity.* Adopted by important Railway and Mining Corporations, Cities, and Towns First Class Medals of *Superiority* awarded by American Institute, 1879 and 1880.
BLAKE CRUSHER CO., Sole Makers, New Haven, Conn.

Never Give Up the Ship.
"Twenty-one years ago I was dying with the CONSUMPTION. There was no escaping that terrible death—at least so all the doctors told me—when a friend advised me to send to 1032 Race St., Philadelphia, and get CANNABIS INDICA, which finally and fully cured me."
O. S. BISLEY, DeKalb, St. Lawrence Co., N. Y.
"Send another $12 box of CANNABIS INDICA for a friend. Your medicine has cured me of CONSUMPTION. I am as sound and well as ever I was. SALLIE D. BENTON.
January 2, 1882. KEYSVILLE, Crawford Co., Mo."
N.B.—This remedy speaks for itself. A single bottle will satisfy the most skeptical. We know that it positively cures Consumption, and will break up a fresh cold in twenty-four hours. $2.50 per Bottle, or Three Bottles for $6.50. Address
CRADDOCK & CO., 1032 Race St., Philadelphia, Pa.
Send stamp for book of testimonials of cures from prominent persons.

A VALUABLE PATENT FOR SALE. Address Box 6, Abbeville, La.

Chamfering Howeling, and Crozing.

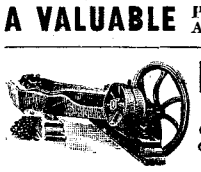
BARREL, KEG, HOGSHEAD, AND Fan and Stave Jointer.

Stave Machinery.
Over 50 varieties manufactured by
E. & B. HOLMES,
Buffalo, N. Y.

Truss Hoop Driving.

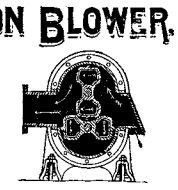
Head Rounding.

Steam Fitters' & Plumbers' Supplies.
STURTEVANT'S FAN BLOWERS.
JOHN S. URQUHART, Successor to
ALBERT BRIDGES, 46 Cortland Street, New York.



FORSTER'S CRUSHER AND CRUSHER AND PULVERIZER.
The simplest machine ever devised for the purpose.
We warrant 50 per cent. advantage in *Crushing,* with one-third power, and in combined Crushing and Pulverizing do the work of stamp and Burrs at one-third first cost. Can be *operated with any kind* of power.
Address TOTTEN & CO., Pittsburg, Pa.

ROOT'S NEW IRON BLOWER.

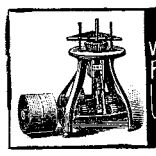


POSITIVE BLAST.
IRON REVOLVERS, PERFECTLY BALANCED,
Has Fewer Parts than any other Blower.
P. H. & F. M. ROOTS, Manufacturers,
CONNERSVILLE, IND.
S. S. TOWNSEND, Gen. Agt., 6 Cortland St., 8 Dey St.,
COOKE & CO., Selling Agts., 6 Cortland Street,
J. S. BEGGS & CO., Selling Agts. 8 Dey Street,
NEW YORK.
SEND FOR PRICED CATALOGUE.

SHEPARD'S CELEBRATED $60
Screw Cutting Foot Lathe.
Foot and Power Lathes, Drill Presses, Scrolls, Saw Attachments, Chucks, Mandrels, Twist Drills, Dogs, Calipers. "Sun Light" Gas Machines, etc. Send for catalogue of outfits for amateurs or artisans. Address
H. L. SHEPARD & CO.,
341 & 343 West Front St., Cincinnati, O.

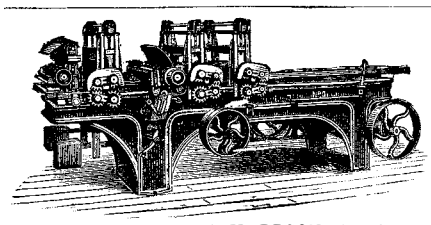
SPEAKING TELEPHONES.
THE AMERICAN BELL TELEPHONE COMPANY,
W. H. FORBES, *President.* W. R. DRIVER, *Treasurer.* THEO. N. VAIL, *Gen. Manager.*

Alexander Graham Bell's patent of March 7, 1876, owned by this company, covers every form of apparatus, including Microphones or Carbon Telephones, in which the voice of the speaker causes electric undulations corresponding to the words spoken, and which articulations produce similar articulate sounds at the receiver. The Commissioner of Patents and the U. S. Circuit Court have decided this to be the true meaning of his claim; the validity of the patent has been sustained in the Circuit on final hearing in a contested case, and many injunctions and final decrees have been obtained on them.
This company also owns and controls all the other telephonic inventions of Bell, Edison, Berliner, Gray, Blake, Phelps, Watson, and others.
(Descriptive catalogues forwarded on application.)
Telephones for Private Line, Club, and Social systems can be procured directly or through the authorized agents of the company.
All telephones obtained except from this company, or its authorized licensees, are infringements, and the makers, sellers, and users will be proceeded against.
Information furnished upon application.
Address all communications to the
AMERICAN BELL TELEPHONE COMPANY,
95 Milk Street, Boston, Mass.



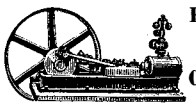
PAT. KEY SEAT CUTTER
WILL CUT 100 SEATS 4½ X ⅝ INCH PER DAY. OTHER SIZES IN PROPORTION
See Sci. Am. VOL. 45, No 5, 181
TREVOR & Co. LOCKPORT, N.Y.

RUPTURE
cured without an operation or the injury trusses inflict by Dr. J. A. SHERMAN'S method. Office, 251 Broadway, New York. His book, with Photographic likenesses of bad cases, before and after cure, mailed for 10c.



WITHERBY, RUGG & RICHARDSON, Manufacturers of Patent Wood Working Machinery of every description. Facilities unsurpassed. Shop formerly occupied by R. Bal & Co., Worcester, Mass. Send for Catalogue.

Horizontal Steam Engines,



For best Automatic Cut-off or Plain Slide Valve of Superior Design, Complete in Every Respect,
ADDRESS
LAMBERTVILLE IRON WORKS,
LAMBERTVILLE, N. J.

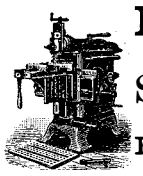
---

105 Elegant *New Style Chromo Cards, name in* Gold and Jet, 10c. American Card Co., W. Haven, Ct.

$66 a week in your own town. Terms and $5 outfit free. Address H. HALLETT & Co., Portland, Me.

FINE WOOD PHOTO-ENGRAVING
SEND COPY FOR ESTIMATE. IT WILL PAY YOU
CROSSCUP & WEST, 702 CHESTNUT ST PHILADA PA

ARTISTIC HOMES.
Just published. **QUEEN ANNE** and **COLONIAL STYLES.** 44 Plans, Elevations, and Interiors. 8x12 Inches each. A BOOK FOR ALL. *Postpaid* on receipt of price, **$3.50.** Agents Wanted.
A. W. FULLER, Architect, Albany, N. Y.



PATENT QUICK
Adjustable Stroke
SHAPERS
Can be Changed while in Motion.
E. GOULD & EBERHARDT,
NEWARK, N. J.

DUVAL'S PATENT DERRICK.
The application for the above patent having been granted by the U. S. Patent Office, the Patentee offers it for sale. It consists of a simple arrangement, by which the arm or crane is pivoted from its center to the top of the mast or upright, the butt of the arm working up and down against the upright when being expanded or contracted, thus enabling the object to be raised to be placed anywhere within the radius of the arm with ease and precision. Further particulars on application to P. O. Box 277, Montreal, Canada.

TAPS & DIES, VISES, CHUCKS, TWIST DRILLS, MACHINE SCREWS, TOOLS, LATHES, FILES, STEEL, TOOL STUBS

TOOLS for Machinists, Carpenters, Amateurs, Jewellers, Model Makers, Blacksmiths, etc. *Send for Catalogue,* and state *what kind* of Tools you require.
TALLMAN & McFADDEN,
607 Market St., Philadelphia, Pa.

© 1882 SCIENTIFIC AMERICAN, INC

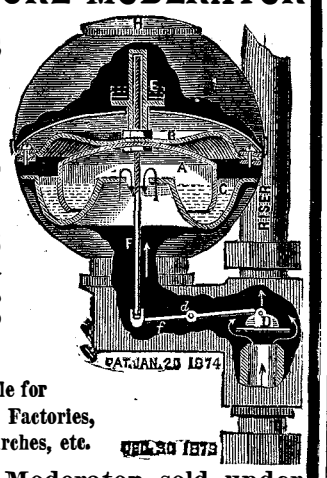
Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.
(About eight words to a line.)

Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

DePALOS'
PRESSURE MODERATOR

SAVES
20 to 50
per cent.
IN
Gas Bills
where they amount to over $10 per month.



Suitable for
Residences, Factories,
Stores, Churches, etc.

Every Moderator sold under our guarantee. Money refunded if machine fails to regulate and save gas as stated. Send for Price List.

HOWARD MFG. CO.,
364 Broadway, New York.

MACHINE KNIVES
FOR PAPERMILLS, BOOKBINDERS, WOOD WORKING AND AGRICULTURAL MACHY. ALSO PARALLEL VISES FOR MACHINISTS, PIPE FITTERS, BLACKSMITHS WHEELWRIGHTS PATTERN MAKERS &C.
MANUFACTURED BY
TAYLOR STILES & CO.
REIGELSVILLE WARREN CO. N.J.

Persons wishing Patented Goods in Light Hardware manufactured,
Address GEO. VAN SANDS, Middletown, Conn.

H.W.JOHNS'
ASBESTOS
LIQUID PAINTS
ASBESTOS ROOFING,
ASBESTOS BOILER COVERINGS,
ASBESTOS LINING FELT,
ASBESTOS STEAM PACKING,
ASBESTOS WICK PACKING,
ASBESTOS FLAT PACKING,
ASBESTOS MILLBOARD,
ASBESTOS GASKETS,
ASBESTOS SHEATHINGS,
COATINGS, CEMENTS, Etc.
Descriptive price lists and samples sent free.
H. W. JOHNS M'F'G CO.,
87 Maiden Lane, New York.

THE BAKER BLOWER.
[FORCED BLAST.]

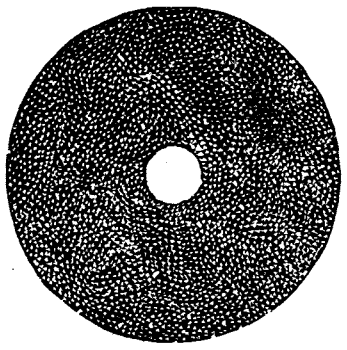
The best in the World for Charcoal Blast Furnaces.
Also for melting Iron in Cupolas for Stove Foundries, etc.
WILBRAHAM BROS,
No. 2320 Frankford Avenue,
PHILADELPHIA, PA.
SEND FOR OUR CATALOGUE.

Stevens' Roller Mills,
FOR
GRADUAL REDUCTION OF GRAIN.
Manufactured exclusively by
THE JOHN T. NOYE MFG. CO., Buffalo, N. Y.

SHAFTS PULLEYS HANGERS
At Low Prices. Large Assorted Stock.
A. & F. BROWN, 57-61 Lewis St., New York.

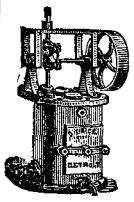
FRIEDMANN'S PATENT INJECTOR,
THE BEST
Boiler Feeder
IN THE WORLD.
Simple, Reliable, and Effective.
40,000 IN ACTUAL USE.
NATHAN & DREYFUS,
Sole Manufacturers, NEW YORK.
Send for Descriptive Catalogue.

WIRE ROPE
Address JOHN A. ROEBLING'S SONS, Manufacturers, Trenton, N. J., or 117 Liberty Street, New York.
Wheels and Rope for conveyng power long distances. Send for circulr.



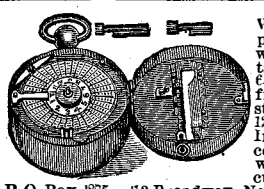
Lehigh Valley Emery Wheel Co.,
LEHIGHTON, PA.,
MANUFACTURERS OF
EMERY AND CORUNDUM WHEELS,
AND GRINDING MACHINERY.
For Sale by COOKE & CO., No. 6 Cortland St., New York; R. W. REXFORD, No. 11 N. 6th St., Philadelphia, Pa.; M. F. PERRY, No. 43 South Canal St., Chicago, Ill.; FOX, CORBY & CO., No. 312 North Third St., St. Louis, Mo.; BERRY & PLACE MACHINERY CO., 323 Market St., San Francisco, Cal.; EXCELSIOR MFG. CO., St. Louis, Mo.

ERICSSON'S
New Caloric Pumping Engine
FOR
DWELLINGS AND COUNTRY SEATS.
Simplest cheapest, and most economical pumping engine for domestic purposes. Any servant girl can operate. Absolutely safe. Send for circulars and price lists.
DELAMATER IRON WORKS
C. H. DELAMATER & CO., Proprietors,
No. 10 Cortlandt Street, New York, N. Y.


BOILER FEEDER.
(A Pump and Heater Combined.)
Guaranteed to make more steam with less fuel than any other way of feeding boilers. Send for circular. Agents wanted.
D. E. RICE,
191 Atwater Street, Detroit, Mich.

THE J. L. MOTT IRON WORKS,
88 and 90 Beekman St., New York.
Demarest's Patent Water Closets used almost exclusively in all fine work. Demarest's Water Closets, Latrine's and Hopper's for public buildings and factories. Mott's Celebrated Porcelain Lined Baths unequaled for beauty and cleanliness. Sanitary Goods of all kinds.

Pyrometers, For showing heat of Ovens, Hot Blast Pipes, Boiler Flues, Superheated Steam, Oil Stills, etc.
HENRY W. BULKLEY, Sole Manufacturer,
149 Broadway, New York.


WATCHMAN'S IMproved Time Detector, with Safety Lock Attachment, Patented 1875-6-7-8-81. Beware of Infringements. This Instrument is supplied with 12 keys for 12 stations. Invaluable for all concerns employing night watchmen. Send for circulars to E. IMHAUSER,
P.O. Box 2875. 412 Broadway, New York.

ROOFING.
For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free. Agents Wanted. T. NEW, 32 John Street, New York.

70 ALL NEW STYLE CHROMO Cards, beautiful designs, name on 10c, handsomest pack ever sold, **50** Elegant new designs, with name 10c. or **25** Extra large Chromos 10c. Gordon Printing Co. Northford Ct.

THE PORTER-ALLEN
High Speed Steam Engine.
ADDRESS
SOUTHWARK FOUNDRY & MACHINE CO.,
430 Washington Ave., Philadelphia, Pa.

PHOTO-ENGRAVING CO.
67-69 PARK PLACE
WESTERN BRANCH 180 DEARBORN ST. CHICAGO. New York.
Engravings for Books and all Advertising purposes · Cheaper than any other Method.

Double Screw, Parallel, Leg Vises.
Made and WARRANTED *stronger* than any other Vise by FISHER & NORRIS only, Trenton, N. J.

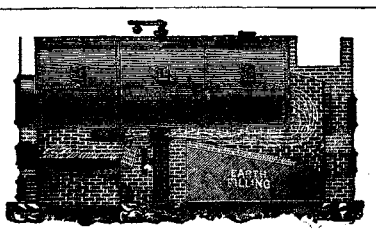
$88 A week to Agents. $10 OUTFIT FREE. RIDEOUT & CO., 10 BARCLAY ST., New York.

JENKINS PATENT PACKING
THE STANDARD
MAKES A PERFECT JOINT
JENKINS BROS. 71 JOHN ST. NY.

GRATEFUL—COMFORTING.
EPPS'S COCOA
BREAKFAST.
"By a thorough knowledge of the natural laws which govern the operations of digestion and nutrition, and by a careful application of the fine properties of well-selected Cocoa, Mr. Epps has provided our breakfast tables with a delicately flavored beverage which may save us many heavy doctors' bills. It is by the judicious use of such articles of diet that a constitution may be gradually built up until strong enough to resist every tendency to disease. Hundreds of subtle maladies are floating around us ready to attack wherever there is a weak point. We may escape many a fatal shaft by keeping ourselves well fortified with pure blood and a properly nourished frame."—*Civil Service Gazette.*
Made simply with boiling water or milk. Sold in tins only (½ lb., and lb.), labeled
JAMES EPPS & CO.,
HOMŒOPATHIC CHEMISTS,
London, England.
New York and Chicago Depots, SMITH & VANDERBEEK.

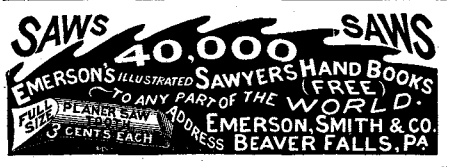
FOR BEST
GOLD PENS.
Send for Price list to
JOHN HOLLAND, Mfr., 9 West 4th St., Cincinnati.

WM. A. HARRIS.
PROVIDENCE, R. I. (PARK STREET),
Six minutes walk West from station.
Original and Only builder of the
HARRIS-CORLISS ENGINE
With Harris' Patented Improvements, from 10 to 1,000 H. P.


Jarvis Furnace Co.
Patent Setting for Steam Boilers Burns Screenings and Slack Coal without Blast. No. 7 Oliver St., Boston; No. 92 Liberty St., New York: No. 709 Market St., St. Louis; No. 18 Second St., Baltimore.

Best Boiler and Pipe Covering Made!

The Celebrated Patent Air Space
COVERING
For STEAM BOILERS and PIPES, HOT BLAST PIPING, etc., etc. Address CHALMERS SPENCE CO., 10 Cortland Street, New York.



New York Belting & Packing Co.
SPECIAL NOTICE.
Owing to the GREAT FIRE in the "World" building, our Warehouse has been removed to
No. 29 PARK ROW,
a few doors from our old stand. JOHN H. CHEEVER, Treas.

THE Cameron Steam Pump.
OVER 30,000 IN USE.
Specially adapted for use in Gold, Silver, Coal, and Iron Mines; also General Manufacturing and Fire Pumps. Pumps furnished with movable Linings in Iron Composition, or Phosphor-Bronze.
THE A. S. CAMERON STEAM PUMP WORKS,
FOOT EAST 23d ST., NEW YORK.

ROCK DRILLS & AIR COMPRESSORS.
1 PARK PLACE INGERSOLL ROCK DRILL CO., NEW YORK.

USE MACHINERY WIPER CLOTHS.
Made by BROWN M'F'G CO., Providence, R. I.

COLUMBIA BICYCLE

Is what every boy wants and what every man ought to have. Send 3c. stamp for illustrated catalogue, with price lists and full information.
THE POPE M'F'G CO.,
597 Washington St., Boston, Mass.

IRIDIUM:
THE HARDEST METAL KNOWN.
Not attacked by acids or alkalies; not oxidized in the air; almost infusible. Manufactured under John Holland's process (patented May 10, 1881) by
THE AMERICAN IRIDIUM CO.,
S. E. Corner Pearl and Plum Sts., Cincinnati, Ohio.

KORTING UNIVERSAL INJECTOR
DOUBLE TUBE

FOR BOILER FEEDING
operated by one Handle
WILL LIFT HOT WATER
WORKING GUARANTEED
ALL BRASS — *Send for Circular* —
OFFICES AND WAREROOMS
PHILADA. 12TH & THOMPSON STS. NEW YORK 109 LIBERTY ST
BOSTON. 7 OLIVER ST. CHICAGO. 84 MARKET ST

HARTFORD
STEAM BOILER
Inspection & Insurance
COMPANY.
W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't.
J. B. PIERCE, Sec'y.

PROSPECTUS
OF THE
Scientific American
FOR 1882.
The Most Popular Scientific Paper in the World.

Only $3.20 a Year, including postage. Weekly. 52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information, and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc.

All Classes of Readers find in the SCIENTIFIC AMERICAN a popular *resume* of the best scientific information of the day; and it is the aim of the publishers to present it in an attractive form, avoiding as much as possible abstruse terms. To every intelligent mind, this journal affords a constant supply of instructive reading. It is promotive of knowledge and progress in every community where it circulates.

Terms of Subscription.—One copy of the SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States or Canada, on receipt of **three dollars and twenty cents** by the publishers; six months, $1.60: three months, $1.00.

Clubs.—One extra copy of the SCIENTIFIC AMERICAN will be supplied gratis *for every club of five subscribers* at $3.20 each; additional copies at same proportionate rate.

One copy of the SCIENTIFIC AMERICAN and one copy of the SCIENTIFIC AMERICAN SUPPLEMENT will be sent for one year, postage prepaid, to any subscriber in the United States or Canada, on receipt of *seven dollars* by the publishers.

The safest way to remit is by Postal Order, Draft, or Express. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO.,
261 Broadway, New York.

To Foreign Subscribers.—Under the facilities of the Postal Union, the SCIENTIFIC AMERICAN is now sent by post direct from New York, with regularity, to subscribers in Great Britain, India, Australia, and all other British colonies; to France, Austria, Belgium, Germany, Russia, and all other European States: Japan, Brazil, Mexico, and all States of Central and South America. **Terms**, when sent to foreign countries, Canada excepted, $4, gold, for SCIENTIFIC AMERICAN, one year; $9, gold, for both SCIENTIFIC AMERICAN and SUPPLEMENT for one year. This includes postage, which we pay. Remit by postal order or draft to order of
MUNN & CO., 261 Broadway, New York.

PRINTING INKS.
THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts. Philadelphia, and 59 Gold St., New York.

© 1882 SCIENTIFIC AMERICAN, INC